

CONTENTS

| | |
|----------------------------------|-----|
| TABLES..... | v |
| ACRONYMS..... | vii |
| 1. INTRODUCTION..... | 1-1 |
| 2. ENVIRONMENTAL MONITORING..... | 2-1 |
| 3. DOSE..... | 3-1 |
| 4. GROUNDWATER..... | 4-1 |

This page left intentionally blank.

TABLES

| | | |
|------|---|------|
| 2.1 | Uranium concentrations in DOE and USEC NPDES outfall water samples for 1999 | 2-3 |
| 2.2 | Radioactivity concentrations in DOE NPDES outfall water samples for 1999 | 2-4 |
| 2.3 | Radioactivity concentrations in USEC NPDES outfall water samples for 1999 | 2-6 |
| 2.4 | DOE/PORTS NPDES permit summary for 1999..... | 2-8 |
| 2.5 | 1999 DOE NPDES discharge and compliance rates | 2-10 |
| 2.6 | 1999 USEC NPDES discharge monitoring results..... | 2-12 |
| 2.7 | USEC ambient air monitoring program alpha, beta high volume air samplers and gaseous fluoride – 1999 | 2-16 |
| 2.8 | USEC ambient air monitoring program alpha, beta low volume air samplers – 1999 | 2-17 |
| 2.9 | USEC direct radiation monitoring program quarterly external gamma radiation measurements (mrem) – 1999..... | 2-18 |
| 2.10 | USEC direct radiation monitoring program summary of quarterly external gamma radiation levels (Frem/hr) – 1999..... | 2-20 |
| 2.11 | USEC surface water monitoring program results of radiological monitoring – 1999 | 2-21 |
| 2.12 | USEC sediment monitoring program monitoring results – 1999..... | 2-23 |
| 2.13 | USEC soil monitoring program results – 1999 | 2-30 |
| 2.14 | USEC vegetation monitoring program results – 1999 | 2-32 |
| 2.15 | USEC biota (fish) monitoring program results – 1999 | 2-34 |
| 2.16 | USEC biota (crops) monitoring program results – 1999..... | 2-35 |
| 3.1 | Curies released by DOE air emission sources in 1999..... | 3-2 |
| 3.2 | DOE air emission source parameters and receptor locations used in 1999 dose calculations | 3-3 |
| 3.3 | Predicted radiation doses from airborne releases (DOE sources only) at DOE/PORTS for 1999.... | 3-3 |
| 4.1 | Volatile organic compounds detected at the X-749/X-120/PK Landfill..... | 4-3 |
| 4.2 | Results for radionuclides at the X-749/X-120/PK Landfill..... | 4-7 |
| 4.3 | Volatile organic compounds detected at the Quadrant I Groundwater Investigative Area | 4-11 |

| | | |
|------|--|------|
| 4.4 | Results for radionuclides at the Quadrant I Groundwater Investigative Area..... | 4-13 |
| 4.5 | Volatile organic compounds detected at the Quadrant II Groundwater Investigative Area..... | 4-17 |
| 4.6 | Results for radionuclides at the Quadrant II Groundwater Investigative Area..... | 4-18 |
| 4.7 | Volatile organic compounds detected at the X-701B Holding Pond | 4-20 |
| 4.8 | Results for radionuclides at the X-701B Holding Pond | 4-21 |
| 4.9 | Volatile organic compounds detected at the X-616 Chromium Sludge Surface Impoundments..... | 4-25 |
| 4.10 | Results for chromium at the X-616 Chromium Sludge Surface Impoundments..... | 4-26 |
| 4.11 | Results for radionuclides at the X-616 Chromium Sludge Surface Impoundments..... | 4-27 |
| 4.12 | Volatile organic compounds detected at the X-740 Hazardous Waste Storage Facility..... | 4-29 |
| 4.13 | Results for radionuclides at the X-740 Hazardous Waste Storage Facility | 4-30 |
| 4.14 | Results for beryllium and chromium at the X-611A Former Lime Sludge Lagoons | 4-32 |
| 4.15 | Results for radionuclides at the X-735 Landfills..... | 4-33 |
| 4.16 | Volatile organic compounds detected at surface water monitoring locations..... | 4-35 |
| 4.17 | Results for radionuclides at surface water monitoring locations..... | 4-36 |
| 4.18 | Results for radionuclides at exit pathway monitoring locations | 4-38 |

ACRONYMS

| | |
|-----------------|---|
| °C | degrees Celsius |
| CFR | Code of Federal Regulations |
| DCG | derived concentration guide |
| DOE | U.S. Department of Energy |
| DOE/PORTS | facilities operated by DOE (not leased to USEC) at the Portsmouth Gaseous Diffusion Plant |
| ENE | east-northeast |
| ft ³ | cubic feet |
| g | gram |
| kg | kilogram |
| km | kilometer |
| L | liter |
| m | meter |
| m ³ | cubic meter |
| FCi | microcurie |
| Fg | microgram |
| Fm | micrometer |
| Frem | microrem |
| mg | milligram |
| MGD | million gallons per day |
| mL | milliliter |
| mrem | millirem |
| NA | not applicable |
| NE | northeast |
| NPDES | National Pollutant Discharge Elimination System |
| NR | not reported |
| pCi | picocurie |
| PK | Peter Kiewit |
| PORTS | Portsmouth Gaseous Diffusion Plant |
| s | second |
| SU | standard unit |
| USEC | United States Enrichment Corporation |

This page left intentionally blank.

1. INTRODUCTION

Environmental monitoring at the Portsmouth Gaseous Diffusion Plant (PORTS) is conducted throughout the year. Monitoring demonstrates that the site is a safe place to work, that plant operations do not adversely affect neighboring communities, and that activities comply with federal and state regulations.

This document is a compilation of the environmental monitoring data for calendar year 1999 and is intended as a tool for analysts in environmental monitoring, environmental restoration, and other related disciplines. The data in this document form the basis for the summary information in the *Portsmouth Annual Environmental Report for 1999* (DOE/OR/11-3052&D1).

This page left intentionally blank.

2. ENVIRONMENTAL MONITORING

This section provides environmental monitoring data collected by both the Department of Energy (DOE) and the United States Enrichment Corporation (USEC) at or nearby PORTS. Data is included for both DOE and USEC National Pollutant Discharge Elimination System (NPDES) outfalls and for the following USEC monitoring programs:

- Ambient air
- Direct radiation
- Surface water
- Sediment
- Soil
- Vegetation
- Biota.

The following tables are included in this section:

- Table 2.1. Uranium concentrations in DOE and USEC NPDES outfall water samples for 1999
- Table 2.2. Radioactivity concentrations in DOE NPDES outfall water samples for 1999
- Table 2.3. Radioactivity concentrations in USEC NPDES outfall water samples for 1999
- Table 2.4. DOE/PORTS NPDES permit summary for 1999
- Table 2.5. 1999 DOE NPDES discharge and compliance rates
- Table 2.6. 1999 USEC NPDES discharge monitoring results
- Table 2.7. USEC ambient air monitoring program alpha, beta high volume air samplers and gaseous fluoride – 1999
- Table 2.8. USEC ambient air monitoring program alpha, beta low volume air samplers – 1999
- Table 2.9. USEC direct radiation monitoring program quarterly external gamma radiation measurements (mrem) – 1999
- Table 2.10. USEC direct radiation monitoring program summary of quarterly external gamma radiation levels (Frem/hr) – 1999
- Table 2.11. USEC surface water monitoring program results of radiological monitoring – 1999
- Table 2.12. USEC sediment monitoring program monitoring results – 1999
- Table 2.13. USEC soil monitoring program results – 1999
- Table 2.14. USEC vegetation monitoring program results – 1999

- Table 2.15. USEC biota (fish) monitoring program results – 1999
- Table 2.16. USEC biota (crops) monitoring program results - 1999

**Table 2.1. Uranium concentrations in DOE and USEC
NPDES outfall water samples for 1999**

| NPDES outfall | Number of samples ^a | Concentration | | |
|----------------------|-----------------------------------|-------------------|-------------------|--------------------------------|
| | | Minimum (mg/L) | Maximum (mg/L) | Average (mg/L) ^b |
| <i>DOE outfalls</i> | | | | |
| 012 | 12(7) | <0.001 | 0.0013 | — |
| 013 | 12(3) | <0.001 | 0.0039 | — |
| 015 | 12(5) | <0.001 | 0.0094 | — |
| 608 | 12(8) | <0.001 | 0.0015 | — |
| 610 | 12(5) | <0.001 | 0.0344 | — |
| 611 | 12(1) | <0.001 | 0.0216 | 0.0120 |
| <i>USEC outfalls</i> | | | | |
| 001 | 52(24) | <0.001 | 0.0043 | — |
| 002 | 48(0) | 0.0010 | 0.0044 | 0.0024 |
| 003 | 51(0) | 0.0025 | 0.0607 | 0.0156 |
| 004 | 51(0) | 0.0013 | 0.0400 | 0.0030 |
| 005 | 1(1) | <0.001 | — | — |
| 009 | 50(0) | 0.0029 | 0.0085 | 0.0055 |
| 010 | 50(0) | 0.0018 | 0.0086 | 0.0038 |
| 011 | 50(29) | <0.001 | 0.0024 | — |

^a Number in parentheses is the number of samples that were below the detection limit.

^b Averages were not calculated for outfalls which had greater than 15% of the results below the detection limit. For outfalls with less than 15% of the results below the detection limit, any result below the detection limit was assigned a value at the detection limit for calculating an average for the parameter.

**Table 2.2. Radioactivity concentrations in DOE
NPDES outfall water samples for 1999**

| NPDES outfall | Number of samples ^b | Concentration | | | DCG ^a (pCi/L) |
|----------------------|-----------------------------------|--------------------|--------------------|---------|-----------------------------|
| | | Minimum (pCi/L) | Maximum (pCi/L) | | |
| <i>gross alpha</i> | | | | | |
| 012 | 12(8) | <0 | 6 | NA | |
| 013 | 12(9) | <1 | 18 | NA | |
| 015 | 12(10) | <2 | 10 | NA | |
| 608 ^c | 12(11) | <2 | 15 | NA | |
| 610 ^c | 12(2) | <1 | 63 | NA | |
| 611 ^c | 12(1) | <2 | 115 | NA | |
| <i>gross beta</i> | | | | | |
| 012 | 12(7) | <2.95 | 16 | NA | |
| 013 | 12(11) | <5 | 43 | NA | |
| 015 | 12(4) | <14 | 292 | NA | |
| 608 ^c | 12(4) | <3 | 25 | NA | |
| 610 ^c | 12(2) | 9 | 35 | NA | |
| 611 ^c | 12(1) | <2 | 23 | NA | |
| <i>technetium-99</i> | | | | | |
| 012 | 12(10) | <-2 | 6 | 100,000 | |
| 013 | 12(12) | <21 | <28 | 100,000 | |
| 015 | 12(6) | <7 | 323 | 100,000 | |
| 608 ^c | 12(12) | <21 | 21 | 100,000 | |
| 610 ^c | 12(11) | <2 | 24 | 100,000 | |
| 611 ^c | 12(12) | <21 | 22 | 100,000 | |
| <i>americium-241</i> | | | | | |
| 012 | 1(1) | <0.073 | — | 30 | |
| 013 | 1(1) | <0.23 | — | 30 | |
| 015 | 1(1) | <0.41 | — | 30 | |
| 608 ^c | 1(1) | <0.021 | — | 30 | |
| 610 ^c | 1(1) | <0.080 | — | 30 | |
| 611 ^c | 1(1) | <0.018 | — | 30 | |
| <i>neptunium-237</i> | | | | | |
| 012 | 1(1) | <0.028 | — | 30 | |
| 013 | 1(1) | <0.0000093 | — | 30 | |
| 015 | 1(1) | <0.023 | — | 30 | |
| 608 ^c | 1(1) | <0.075 | — | 30 | |
| 610 ^c | 1(1) | <0.096 | — | 30 | |
| 611 ^c | 1(1) | <0.030 | — | 30 | |
| <i>plutonium-238</i> | | | | | |
| 012 | 1(1) | <0.26 | — | 40 | |
| 013 | 1(1) | <0.046 | — | 40 | |
| 015 | 1(1) | <0.023 | — | 40 | |
| 608 ^c | 1(1) | <0.075 | — | 40 | |
| 610 ^c | 1(1) | <0.064 | — | 40 | |
| 611 ^c | 1(1) | <0.042 | — | 40 | |

**Table 2.2. Radioactivity concentrations in DOE NPDES
outfall water samples for 1999 (continued)**

| NPDES outfall | Number of samples ^b | Concentration | | DCG ^a (pCi/L) |
|--------------------------|-----------------------------------|--------------------|--------------------|-----------------------------|
| | | Minimum (pCi/L) | Maximum (pCi/L) | |
| <i>plutonium-239/240</i> | | | | |
| 012 | 1(1) | <0.00000047 | — | 30 |
| 013 | 1(1) | <0.046 | — | 30 |
| 015 | 1(1) | <0.091 | — | 30 |
| 608 ^c | 1(1) | <0.068 | — | 30 |
| 610 ^c | 1(1) | <0.064 | — | 30 |
| 611 ^c | 1(1) | <0.021 | — | 30 |
| <i>thorium-230</i> | | | | |
| 015 | 1(1) | <0.064 | — | 300 |
| 610 ^c | 1(1) | <0.27 | — | 300 |
| 611 ^c | 1(1) | <0.085 | — | 300 |

^a Derived Concentration Guide. A derived concentration guide is not available for gross alpha or gross beta.

^b Number in parentheses is the number of samples that were below the detection limit.

^c These outfalls discharge to USEC NPDES Outfall 003 (X-6619 Sewage Treatment Plant).

**Table 2.3. Radioactivity concentrations in USEC
NPDES outfall water samples for 1999**

| NPDES outfall | Number of samples ^a | Concentration | |
|----------------------|-----------------------------------|--------------------|--------------------|
| | | Minimum (pCi/L) | Maximum (pCi/L) |
| <i>gross alpha</i> | | | |
| 001 | 52(29) | <2 | 18 |
| 002 | 48(35) | <4 | 12 |
| 003 | 51(1) | <7 | 232 |
| 004 | 52(46) | <7 | 40 |
| 005 | 1(1) | <3 | — |
| 009 | 51(20) | <3 | 11 |
| 010 | 51(25) | <2 | 13 |
| 011 | 51(46) | <1 | 10 |
| <i>gross beta</i> | | | |
| 001 | 52(12) | <6 | 87 |
| 002 | 48(15) | <8 | 27 |
| 003 | 51(0) | 28 | 217 |
| 004 | 52(5) | <21 | 265 |
| 005 | 1(0) | 9 | — |
| 009 | 51(27) | <7 | 103 |
| 010 | 51(21) | <6 | 43 |
| 011 | 51(33) | <6 | 40 |
| <i>technetium-99</i> | | | |
| 001 | 52(44) | <10 | 75 |
| 002 | 48(47) | <10 | 28 |
| 003 | 52(14) | <20 | 161 |
| 004 | 52(51) | <10 | 78 |
| 005 | 1(1) | <10 | — |
| 009 | 51(27) | <10 | 54 |
| 010 | 51(51) | <10 | <28 |
| 011 | 51(51) | <10 | <28 |
| <i>americium-241</i> | | | |
| 001 | 4(4) | <0.20 | <0.36 |
| 002 | 4(4) | <0.23 | <0.38 |
| 003 | 5(5) | <0.07 | <0.30 |
| 004 | 4(4) | <0.24 | <0.29 |
| 009 | 4(4) | <0.1 | <0.35 |
| 010 | 4(4) | <0.13 | <0.3 |
| 011 | 4(4) | <0.25 | <.38 |
| <i>neptunium-237</i> | | | |
| 001 | 4(4) | <0.03 | <0.26 |
| 002 | 4(4) | <0.06 | <0.19 |
| 003 | 5(5) | <0.04 | <0.25 |
| 004 | 4(4) | <0.07 | <0.28 |
| 009 | 4(4) | <0.13 | <0.21 |
| 010 | 4(4) | <0.08 | <0.19 |
| 011 | 4(4) | <0.05 | <0.26 |

Table 2.3. Radioactivity concentrations in USEC NPDES outfall water samples for 1999 (continued)

| NPDES outfall | Number of samples ^a | Concentration Minimum (pCi/L) | Maximum (pCi/L) |
|--------------------------|--------------------------------|----------------------------------|-----------------|
| <i>plutonium-238</i> | | | |
| 001 | 4(4) | <0.05 | <0.21 |
| 002 | 4(4) | <0.04 | <0.21 |
| 003 | 5(5) | < 0.14 | <0.28 |
| 004 | 4(4) | <0.048 | <0.1 |
| 009 | 4(4) | <0.054 | <0.21 |
| 010 | 4(4) | <0.047 | <0.15 |
| 011 | 4(4) | <0.055 | <0.22 |
| <i>plutonium-239/240</i> | | | |
| 001 | 4(4) | <0.030 | <0.14 |
| 002 | 4(4) | <0.058 | <0.017 |
| 003 | 5(5) | <0.04 | <0.28 |
| 004 | 4(4) | <0.13 | <0.30 |
| 009 | 4(4) | <0.039 | <0.22 |
| 010 | 4(4) | <0.047 | <0.16 |
| 011 | 4(4) | <0.05 | <0.14 |

^a Number in parentheses is the number of samples that were below the detection limit.

Table 2.4. DOE/PORTS NPDES permit summary for 1999

| Effluent characteristics | | Monitoring requirements | | Discharge limitations | |
|---|-------|-------------------------|----------------------------|-----------------------|---------|
| Parameter | Units | Measurement frequency | Sampling type | Concentration | |
| | | | | 30-day | Daily |
| <i>Outfall 012 (X-2230M Holding Pond)</i> | | | | | |
| Flow rate | MGD | 1/day | 24-hour total ^a | | |
| pH | SU | 1/2 weeks | Grab | | 6.5-9.0 |
| Total suspended solids | mg/L | 1/2 weeks | Grab | 30 | 45 |
| Total oil and grease | mg/L | 1/2 weeks | Grab | 10 | 20 |
| Total residual chlorine ^b | mg/L | 1/2 weeks | Grab | | |
| Phosphorus, Total | mg/L | 1/2 weeks | Grab | | |
| Hexavalent chromium | Fg/L | 1/2 weeks | Grab | | |
| Total chromium | Fg/L | 1/2 weeks | Grab | | |
| Trichloroethene | Fg/L | 1.2 weeks | Grab | | |
| PCBs ^c | Fg/L | 1/quarter | Grab | | |
| <i>Outfall 013 (X-2230N Holding Pond)</i> | | | | | |
| Flow rate | MGD | 1/day | 24-hour total ^a | | |
| pH | SU | 1/2 weeks | Grab | | 6.5-9.0 |
| Total suspended solids | mg/L | 1/2 weeks | Grab | 30 | 45 |
| Total oil and grease | mg/L | 1/2 weeks | Grab | 10 | 20 |
| Total residual chlorine ^b | mg/L | 1/2 weeks | Grab | | |
| Phosphorus | mg/L | 1/2 weeks | Grab | | |
| Hexavalent chromium | Fg/L | 1.2 weeks | Grab | | |
| Total chromium | Fg/L | 1/2 weeks | Grab | | |
| PCBs ^c | Fg/L | 1/quarter | Grab | | |
| <i>Outfall 015 (X-624 Groundwater Treatment Facility)</i> | | | | | |
| Flow rate | MGD | Daily | 24-hour total | | |
| Trichloroethene | Fg/L | 1/2 weeks | Grab | 10 | 10 |
| PCBs ^c | Fg/L | 1/quarter | Grab | | |
| <i>Outfall 608 (X-622 Groundwater Treatment Facility)</i> | | | | | |
| Flow rate | MGD | 1/day | 24-hour total ^a | | |
| pH | SU | 1/week | Grab | | |
| Total zinc | Fg/L | 1/2 weeks | Grab | | |
| Trichloroethene | Fg/L | 1/2 weeks | Grab | | 10 |
| 1,2-trans-dichloroethene | Fg/L | 1/2 weeks | Grab | 25 | 66 |

Table 2.4. DOE/PORTS NPDES permit summary for 1999 (continued)

| Effluent characteristics | | Monitoring requirements | | Discharge limitations | |
|--|-------|-------------------------|---------------|-------------------------|-------|
| Parameter | Units | Measurement frequency | Sampling type | Concentration 30-day | Daily |
| <i>Outfall 610 (X-623 Groundwater Treatment Facility)</i> | | | | | |
| Flow rate | MGD | 1/day | 24-hour total | | |
| pH | SU | 1/week | Grab | | |
| Total zinc | Fg/L | 1/2 weeks | Grab | | |
| Trichloroethene | Fg/L | 1/2 weeks | Grab | 10 | 10 |
| 1,2-trans-dichloroethene | Fg/L | 1/2 weeks | Grab | 25 | 66 |
| <i>Outfall 611 (X-622T Groundwater Treatment Facility)</i> | | | | | |
| Flow rate | MGD | 1/day | 24-hour total | | |
| Trichloroethene | Fg/L | 1/2 weeks | Grab | 10 | 10 |

^a Estimated.

^b Summer only.

^c No detectable PCBs without a numerical limit.

Table 2.5. 1999 DOE NPDES discharge and compliance rates

| Parameter | NPDES compliance rate (%) | Number of samples ^d | Concentration/Loading | | | Units |
|---|---------------------------------|-----------------------------------|-----------------------|---------|----------------------|-------|
| | | | Minimum | Maximum | Average ^e | |
| <i>Outfall 012 (X-2230M Holding Pond)</i> | | | | | | |
| Flow | a | 249 | 0.000 | 15.113 | 0.452 | MGD |
| pH | 100 | 22 | 7.3 | 8.6 | 7.7 | SU |
| Total suspended solids | 100 | 22(1) | <2.0 | 23.00 | 8.36 | mg/L |
| 30 day average | 100 | 12 | 1.65 | 13.31 | 7.22 | mg/L |
| Oil and grease | 100 | 22(22) | <5.0 | <5.0 | — | mg/L |
| 30 day average | 100 | 12 | — | — | — | mg/L |
| Phosphorus | b | 22(6) | <0.03 | 0.06 | — | mg/L |
| Total residual chlorine | b | 10(10) | <0.19 | <0.19 | — | mg/L |
| Hexavalent chromium | b | 22(22) | <0.01 | <0.01 | — | Fg/L |
| Total chromium | b | 22(22) | <13.5 | <13.5 | — | Fg/L |
| Trichloroethylene | b | 22(20) | <1.0 | 1.00 | — | Fg/L |
| PCBs | c | 4(4) | <1.0 | <1.0 | — | Fg/L |
| <i>Outfall 013 (X-2230N Holding Pond)</i> | | | | | | |
| Flow | a | 249 | 0.005 | 6.825 | 0.259 | MGD |
| pH | 100 | 24 | 7.0 | 8.5 | 7.7 | SU |
| Total suspended solids | 100 | 24(0) | <2.0 | 10.00 | 5.25 | mg/L |
| 30 day average | 100 | 12 | 2.50 | 9.03 | 5.29 | mg/L |
| Oil and grease | 100 | 24(24) | <5.0 | <5.0 | — | mg/L |
| 30 day average | 100 | 12 | — | — | — | mg/L |
| Phosphorus | b | 24(12) | <0.03 | 0.14 | — | mg/L |
| Total residual chlorine | b | 12(12) | <0.19 | <0.19 | — | mg/L |
| Hexavalent chromium | b | 24(24) | <0.01 | <0.01 | — | Fg/L |
| Total chromium | b | 24(24) | <13.5 | <13.5 | — | Fg/L |
| PCBs | c | 4(4) | <1.0 | <1.0 | — | Fg/L |
| <i>Outfall 015 (X-624 Groundwater Treatment Facility)</i> | | | | | | |
| Flow | a | 365 | 0.000 | 0.100 | 0.008 | MGD |
| Trichloroethylene | 100 | 24(23) | <1.0 | <1.0 | — | Fg/L |
| 30 day average | 100 | 12 | — | — | — | Fg/L |
| PCBs | c | 4 | <1.0 | — | — | Fg/L |
| <i>Outfall 608 (X-622 Groundwater Treatment Facility)</i> | | | | | | |
| Flow | a | 365 | 0.010 | 0.030 | 0.020 | MGD |
| pH | 100 | 50 | 6.5 | 7.2 | 6.9 | SU |
| Trichloroethylene | 100 | 23(23) | <1.0 | <1.0 | — | Fg/L |
| 1,2-trans-dichloroethylene | 100 | 23(23) | <1.0 | <1.0 | — | Fg/L |
| 30 day average | 100 | 12 | — | — | — | Fg/L |
| Total zinc | b | 24(10) | <5.2 | 32 | — | Fg/L |

Table 2.5. 1999 DOE NPDES discharge and compliance rates (continued)

| Parameter | NPDES compliance rate (%) | Number of samples ^d | Concentration/Loading | | | |
|--|---------------------------------|-----------------------------------|-----------------------|---------|----------------------|-------|
| | | | Minimum | Maximum | Average ^e | Units |
| <i>Outfall 610 (X-623 Groundwater Treatment Facility)</i> | | | | | | |
| Flow | a | 365 | 0.000 | 0.040 | 0.009 | MGD |
| pH | 100 | 50 | 6.7 | 8.7 | 7.3 | SU |
| Trichloroethylene | 100 | 25(25) | <1.0 | <1.0 | — | Fg/L |
| 30 day average | 100 | 12 | — | — | — | Fg/L |
| 1,2-trans-dichloroethylene | 100 | 25(25) | <1.0 | <1.0 | — | Fg/L |
| 30 day average | 100 | 12 | — | — | — | Fg/L |
| Total zinc | b | 25(12) | <5.2 | 107 | — | Fg/L |
| <i>Outfall 611 (X-622T Groundwater Treatment Facility)</i> | | | | | | |
| Flow | a | 365 | 0.014 | 0.310 | 0.030 | MGD |
| Trichloroethylene | 100 | 24(24) | <1.0 | <1.0 | — | Fg/L |
| 30 day average | 100 | 12 | — | — | — | Fg/L |

^a Flow does not have a numerical limit, no compliance rates are generated.

^b Monitoring only required.

^c The permit specifies no detectable PCBs in the effluent without setting a numerical limit of detection.

^d Number in parenthesis is the number of samples that were below the detection limit.

^e Averages were not calculated for parameters that had greater than 15% of the results below the detection limit.

Table 2.6. 1999 USEC NPDES discharge monitoring results

| Parameter | Number of samples ^a | Concentration | | | Units |
|--|--------------------------------|---------------|---------|----------------------|----------|
| | | Minimum | Maximum | Average ^b | |
| <i>Outfall 001 (X-230J7 East Holding Pond)</i> | | | | | |
| Flow | 365 | 0.672 | 3.586 | 1.499 | MGD |
| pH | 52 | 6.8 | 8.3 | 7.7 | SU |
| Total suspended solids | 52(32) | <2.0 | 6.00 | — | mg/L |
| Oil and grease | 52(51) | <5.0 | 7.20 | — | mg/L |
| Total residual chlorine | 26(24) | 0.00 | 0.05 | — | mg/L |
| Phosphorus | 12(10) | <0.03 | 0.16 | — | mg/L |
| Hexavalent chromium | 13(13) | <0.01 | 0.00 | — | Fg/L |
| Chromium, total | 13(13) | <13.5 | 0.00 | — | Fg/L |
| Nickel | 13(10) | <7.7 | 12.10 | — | Fg/L |
| Zinc | 13(2) | <24.7 | 78.40 | — | Fg/L |
| PCBs | 5(4) | <1.0 | 83.00 | 16.60 | Fg/L |
| Trichloroethylene | 51(51) | <1.0 | 0.00 | — | Fg/L |
| <i>Outfall 002 (X-230K South Holding Pond)</i> | | | | | |
| Flow | 349 | 0.000 | 2.426 | 0.420 | MGD |
| pH | 46 | 7.1 | 8.9 | 8.0 | SU |
| Total suspended solids | 44(2) | <2.0 | 26.6 | 10.4 | mg/L |
| Phosphorus | 12(0) | 0.12 | 0.45 | 0.28 | mg/L |
| Oil and grease | 46(43) | <5.0 | 7.20 | — | Fg/L |
| Hexavalent chromium | 45(45) | <0.01 | <0.01 | — | Fg/L |
| Copper | 46(9) | <3.8 | 19.40 | — | Fg/L |
| Zinc | 46(2) | <5.2 | 76.40 | 34.9 | Fg/L |
| Trichloroethylene | 46(46) | <1.0 | <1.0 | — | Fg/L |
| Chromium, total | 12(12) | <13.5 | <13.5 | — | Fg/L |
| Iron | 12(0) | 175.00 | 2700 | 816 | Fg/L |
| Manganese | 12(0) | 21.3 | 246 | 99.9 | Fg/L |
| Phenol | 7(7) | <0.05 | <0.05 | — | Fg/L |
| PCBs | 2(2) | <1 | <1 | — | Fg/L |
| <i>Outfall 003 (X-6619 Sewage Treatment Plant)</i> | | | | | |
| Flow | 365 | 0.181 | 0.788 | 0.402 | MGD |
| pH | 249 | 7.1 | 8.000 | 7.546 | SU |
| Oil and grease | 4(4) | <5.0 | <5.0 | — | mg/L |
| Phosphorus | 12(0) | 0.5 | 1.1 | 0.8 | mg/L |
| Total residual chlorine | 124(123) | <0.02 | <0.02 | — | mg/L |
| Total suspended solids | 52(45) | <2 | 4.4 | — | mg/L |
| Biochemical oxygen demand | 53(53) | <5 | <5 | — | mg/L |
| Fecal coliform | 26(1) | 0.0 | 33.0 | 8.0 | #/100 mL |
| Ammonia | 26(18) | 0.1 | 0.9 | — | Fg/L |
| Nickel | 52(18) | <7.0 | 20.1 | 9.81 | Fg/L |
| Nitrate | 26(0) | 4.2 | 9.1 | 6.0 | Fg/L |
| Arsenic | 26(24) | <29.4 | 37.0 | — | Fg/L |
| Cadmium, total | 26(24) | <2.5 | 3.3 | — | Fg/L |
| Hexavalent chromium | 26(26) | <0.01 | 0.0 | — | Fg/L |
| Copper | 26(0) | 30.6 | 271.0 | 66.7 | Fg/L |

Table 2.6. 1999 USEC NPDES discharge monitoring results (continued)

| Parameter | Number of samples ^a | Concentrations | | | Units |
|--|--------------------------------|----------------|---------|----------------------|-------|
| | | Minimum | Maximum | Average ^b | |
| <i>Outfall 003 (X-6619 Sewage Treatment Plant) (continued)</i> | | | | | |
| Iron | 26(1) | <5.8 | 175.0 | 54.3 | Fg/L |
| Silver | 26(3) | <4.5 | 21.7 | 14.9 | Fg/L |
| Zinc | 26(0) | 6.7 | 140.0 | 50.7 | Fg/L |
| Mercury | 25(25) | <1.0 | 0.0 | — | Fg/L |
| PCBs | 4(4) | <1.0 | <1.0 | — | Fg/L |
| <i>Outfall 004(X-616 Liquid Effluent Control Facility)</i> | | | | | |
| Flow | 365 | 0.300 | 1.123 | 0.807 | MGD |
| pH | 103 | 6.8 | 7.9 | 7.2 | SU |
| Total suspended solids | 49(29) | <2.0 | 7.2 | — | mg/L |
| Oil and grease | 48(41) | <5.0 | 9.3 | — | mg/L |
| Total dissolved solids | 52(0) | 2401 | 3469 | 2865 | mg/L |
| Chromium, total | 48(46) | 0.0 | 15.0 | — | Fg/L |
| Copper | 52(0) | 14.0 | 33.7 | 21.6 | Fg/L |
| Iron | 52(0) | 93.0 | 351 | 186 | Fg/L |
| Zinc | 51(0) | 16.2 | 276 | 53.4 | Fg/L |
| Hexavalent chromium (dissolved) | 48(48) | <0.01 | <0.01 | — | Fg/L |
| Chloroform | 48(48) | <1.0 | <1.0 | — | Fg/L |
| Trichloroethylene | 48(48) | <1.0 | <1.0 | — | Fg/L |
| Mercury | 22(22) | <1 | <1 | — | Fg/L |
| PCBs | 4(4) | <1 | <1 | — | Fg/L |
| <i>Outfall 005 (X-611B Lime Sludge Lagoon)</i> | | | | | |
| Flow | 365 | — | 0.001 | — | MGD |
| pH | 1(0) | — | 8.4 | — | SU |
| Total suspended solids | 1(0) | — | 19.2 | — | mg/L |
| PCBs | 1(1) | — | 0.0 | — | Fg/L |
| <i>Outfall 009 (X-230L North Holding Pond)</i> | | | | | |
| Flow | 296 | 0.000 | 3.549 | 0.525 | MGD |
| pH | 52 | 7.3 | 9.0 | 7.8 | SU |
| Total residual chlorine | 23(19) | <0.012 | 0.015 | — | mg/L |
| Total suspended solids | 52(9) | <2.0 | 54 | — | mg/L |
| Oil and grease | 52(52) | <5.0 | <5.0 | — | mg/L |
| Phosphorus | 52(36) | <0.03 | 0.430 | — | mg/L |
| Hexavalent chromium | 52(52) | <0.01 | <0.01 | — | Fg/L |
| Chromium, total | 52(51) | <13.5 | 0 | — | Fg/L |
| Zinc | 52(1) | <5.2 | 87.5 | 40.1 | Fg/L |

Table 2.6. 1999 USEC NPDES discharge monitoring results (continued)

| Parameter | Number of samples ^a | Concentration | | | Units |
|---|--------------------------------|---------------|---------|----------------------|-------|
| | | Minimum | Maximum | Average ^b | |
| <i>Outfall 010 (X-230J5 Northwest Holding Pond)</i> | | | | | |
| Flow | 365 | 0.085 | 0.770 | 0.263 | MGD |
| pH | 26 | 7.0 | 7.9 | 7.6 | SU |
| Total suspended solids | 26(2) | <2 | 120 | 10.8 | mg/L |
| Oil and grease | 26(24) | <5 | 9.8 | — | mg/L |
| Phosphorus | 26(16) | <0.03 | 0.10 | — | mg/L |
| Hexavalent chromium | 26(26) | <0.01 | <0.01 | — | Fg/L |
| Chromium, total | 26(25) | <13.5 | 28.2 | — | Fg/L |
| Zinc | 26(1) | <5.2 | 95.0 | 48.0 | Fg/L |
| PCBs | 4(4) | <1 | <1 | — | Fg/L |
| <i>Outfall 011 (X-230J6 Northeast Holding Pond)</i> | | | | | |
| Flow | 310 | 0 | 0.338 | 0.045 | MGD |
| Temperature | 28 | 4.5 | 27.1 | 16.2 | °C |
| pH | 28 | 7.1 | 8.2 | 7.6 | SU |
| Total suspended solids | 24(13) | <2.0 | 7.6 | — | mg/L |
| Oil and grease | 25(24) | <5 | 3.6 | — | mg/L |
| Phosphorus | 24(12) | <0.03 | 0.2 | — | mg/L |
| Hexavalent chromium | 24(24) | <0.01 | 0.0 | — | Fg/L |
| Total chromium | 24(23) | <13.5 | 15.0 | — | Fg/L |
| Zinc, total | 26(1) | <5.2 | 190.0 | 57.5 | Fg/L |
| PCBs | 4(4) | <1.0 | <1.00 | — | Fg/L |
| <i>Outfall 602 (X-621 Coal Pile Runoff Treatment Facility)</i> | | | | | |
| Flow | 365 | 0.000 | 0.096 | 0.047 | MGD |
| pH | 51 | 8.4 | 9.9 | 9.2 | SU |
| Total suspended solids | 26(3) | <2.0 | 21 | 4.8 | mg/L |
| Iron | 26(0) | 9 | 972 | 344 | Fg/L |
| Manganese | 26(0) | 4 | 113 | 31.7 | Fg/L |
| <i>Outfall 604 (X-700 Biodenitrification Facility)</i> | | | | | |
| Flow | 365 | 0.000 | 0.054 | 0.028 | MGD |
| pH | 25 | 7.4 | 8.6 | 7.9 | SU |
| Nitrate | 25(16) | <0.1 | 19.0 | — | mg/L |
| Copper | 26(0) | 7.5 | 64.7 | 22.6 | Fg/L |
| Iron | 25(0) | 29.1 | 705 | 125 | Fg/L |
| Nickel | 25(14) | <7.7 | 24.0 | — | Fg/L |
| Zinc | 25(1) | <5.2 | 126 | 37.5 | Fg/L |
| <i>Outfall 605 (X-705 Decontamination Microfiltration System)</i> | | | | | |
| Flow | 365 | 0.000 | 0.025 | 0.006 | MGD |
| pH | 90 | 7.6 | 9.5 | 8.3 | SU |
| Total suspended solids | 22(22) | <2.0 | <2.0 | — | mg/L |
| Oil and grease | 22(19) | <5 | 10.7 | — | mg/L |
| Nitrate | 24(0) | 0.280 | 170 | 44.8 | mg/L |
| Sulfate | 24(0) | 70 | 418 | 127 | mg/L |

Table 2.6. 1999 USEC NPDES discharge monitoring results (continued)

| Parameter | Number of samples ^a | Concentration | | | Units |
|---|--------------------------------|---------------|---------|----------------------|-------|
| | | Minimum | Maximum | Average ^b | |
| <i>Outfall 605 (X-705 Decontamination Microfiltration System) (continued)</i> | | | | | |
| Ammonia | 11(4) | <0.1 | 5.7 | — | mg/L |
| Nitrite | 12(3) | <0.1 | 2.4 | — | mg/L |
| Nitrogen, Kjeldahl, total | 11(0) | 0.20 | 6.4 | 1.3 | mg/L |
| Hexavalent chromium | 23(21) | <0.01 | 0.02 | — | Fg/L |
| Total chromium | 22(22) | <13.5 | <13.5 | — | Fg/L |
| Copper | 24(1) | <3.8 | 273 | 51.3 | Fg/L |
| Iron | 24(3) | <5.8 | 198 | 43.2 | Fg/L |
| Nickel | 24(3) | <7.0 | 370 | 69.3 | Fg/L |
| Zinc | 24(4) | <5.2 | 42.0 | — | Fg/L |
| Trichloroethylene | 22(22) | <1.0 | <1.0 | — | Fg/L |
| <i>Outfall 902 (downstream of outfall 001)</i> | | | | | |
| Temperature | 104 | 5.0 | 30.0 | 19.4 | °C |
| <i>Outfall 903 (downstream of outfall 002)</i> | | | | | |
| Temperature | 104 | 1.0 | 29.0 | 14.9 | °C |

^a Number in parenthesis is the number of samples that were below the detection limit.^b Averages were not calculated for parameters which had greater than 15% of the results below the detection limit. For outfalls with less than 15% of the results below the detection limit, any result below the detection limit was assigned a value at the detection limit for calculating the average for the parameter.

**Table 2.7. USEC ambient air monitoring program alpha, beta high volume
air samplers and gaseous fluoride – 1999**

| Sampling Location | Parameter ^a | No. of measurements | Minimum | Maximum | Average | Background (A37) |
|------------------------------|------------------------|---------------------|---------|---------|---------|------------------|
| <i>On-site air samplers</i> | | | | | | |
| A10 | alpha | 52 | 0.002 | 0.016 | 0.006 | 0.005 |
| | beta | 52 | 0.017 | 0.116 | 0.052 | 0.048 |
| | fluorides | 52 | 0.03 | 0.10 | 0.06 | 0.08 |
| A36 | fluorides | 52 | 0.07 | 0.58 | 0.19 | 0.08 |
| A40 | fluorides | 51 | 0.00 | 0.34 | 0.13 | 0.08 |
| <i>Off-site air samplers</i> | | | | | | |
| A3 | alpha | 52 | 0.001 | 0.014 | 0.005 | 0.005 |
| | beta | 52 | 0.015 | 0.102 | 0.045 | 0.048 |
| | fluorides | 49 | 0.04 | 0.44 | 0.10 | 0.08 |
| A6 | fluorides | 52 | 0.04 | 0.18 | 0.09 | 0.08 |
| A8 | alpha | 52 | 0.001 | 0.011 | 0.004 | 0.005 |
| | beta | 52 | 0.018 | 0.114 | 0.051 | 0.048 |
| | fluorides | 46 | 0.04 | 0.17 | 0.08 | 0.08 |
| A9 | alpha | 52 | 0.001 | 0.011 | 0.005 | 0.005 |
| | beta | 52 | 0.030 | 0.096 | 0.054 | 0.048 |
| | fluorides | 52 | 0.04 | 0.15 | 0.07 | 0.08 |
| A12 ^b | alpha | 52 | 0.003 | 0.255 | 0.034 | 0.005 |
| | beta | 52 | 0.008 | 0.462 | 0.115 | 0.048 |
| | fluorides | 52 | 0.00 | 0.27 | 0.09 | 0.08 |
| A15 | alpha | 52 | 0.001 | 0.017 | 0.005 | 0.005 |
| | beta | 52 | 0.030 | 0.129 | 0.052 | 0.048 |
| | fluorides | 52 | 0.04 | 0.46 | 0.11 | 0.08 |
| A23 | alpha | 52 | 0.002 | 0.012 | 0.005 | 0.005 |
| | beta | 52 | 0.027 | 0.126 | 0.048 | 0.048 |
| | fluorides | 48 | 0.00 | 0.21 | 0.09 | 0.08 |
| A24 | fluorides | 52 | 0.00 | 0.28 | 0.12 | 0.08 |
| A28 | alpha | 13 | 0.001 | 0.016 | 0.004 | 0.005 |
| | beta | 13 | 0.022 | 0.071 | 0.042 | 0.048 |
| | fluorides | 52 | 0.07 | 0.23 | 0.12 | 0.08 |
| A29 ^b | alpha | 9 | 0.000 | 0.007 | 0.002 | 0.005 |
| | beta | 9 | 0.000 | 0.045 | 0.026 | 0.048 |
| | fluorides | 52 | 0.00 | 0.18 | 0.06 | 0.08 |
| A37 (background) | alpha | 46 | 0.001 | 0.012 | 0.005 | - |
| | beta | 46 | 0.013 | 0.097 | 0.048 | - |
| | fluorides | 52 | 0.05 | 0.26 | 0.08 | - |
| A41 | alpha | 52 | 0.001 | 0.015 | 0.005 | 0.005 |
| | beta | 52 | 0.025 | 0.146 | 0.053 | 0.048 |
| | fluorides | 50 | 0.00 | 0.13 | 0.06 | 0.08 |

^a Alpha and beta measured in pCi/m³. Fluorides measured in Fg/m³

^b Measurement of fluorides at locations A12 and A29 is based on theoretical air flow.

**Table 2.8. USEC ambient air monitoring program
alpha, beta low volume air samplers – 1999**

| Sampling Location | Parameter ^a | No. of measurements | Minimum | Maximum | Average | Background (A37) |
|------------------------------|------------------------|---------------------|---------|---------|---------|------------------|
| <i>On-site air samplers</i> | | | | | | |
| A10 | alpha | 12 | 0.001 | 0.007 | 0.002 | 0.002 |
| | beta | 12 | 0.012 | 0.067 | 0.020 | 0.023 |
| A36 | alpha | 12 | 0.001 | 0.006 | 0.003 | 0.002 |
| | beta | 12 | 0.012 | 0.085 | 0.028 | 0.023 |
| A40 | alpha | 12 | 0.001 | 0.007 | 0.002 | 0.002 |
| | beta | 12 | 0.002 | 0.097 | 0.026 | 0.023 |
| <i>Off-site air samplers</i> | | | | | | |
| A3 | alpha | 12 | 0.000 | 0.022 | 0.003 | 0.002 |
| | beta | 12 | 0.007 | 0.055 | 0.021 | 0.023 |
| A6 | alpha | 12 | 0.001 | 0.003 | 0.002 | 0.002 |
| | beta | 12 | 0.013 | 0.059 | 0.025 | 0.023 |
| A8 | alpha | 12 | 0.001 | 0.009 | 0.003 | 0.002 |
| | beta | 12 | 0.013 | 0.085 | 0.025 | 0.023 |
| A9 | alpha | 12 | 0.000 | 0.010 | 0.002 | 0.002 |
| | beta | 12 | 0.013 | 0.075 | 0.026 | 0.023 |
| A12 ^b | alpha | 12 | 0.001 | 0.007 | 0.002 | 0.002 |
| | beta | 12 | 0.006 | 0.084 | 0.025 | 0.023 |
| A15 | alpha | 12 | 0.001 | 0.003 | 0.002 | 0.002 |
| | beta | 12 | 0.010 | 0.043 | 0.023 | 0.023 |
| A23 | alpha | 12 | 0.001 | 0.004 | 0.002 | 0.002 |
| | beta | 12 | 0.012 | 0.046 | 0.022 | 0.023 |
| A24 | alpha | 12 | 0.001 | 0.009 | 0.003 | 0.002 |
| | beta | 12 | 0.011 | 0.157 | 0.042 | 0.023 |
| A28 | alpha | 12 | 0.001 | 0.008 | 0.003 | 0.002 |
| | beta | 12 | 0.010 | 0.079 | 0.028 | 0.023 |
| A29 ^b | alpha | 9 | 0.000 | 0.003 | 0.001 | 0.002 |
| | beta | 9 | 0.003 | 0.026 | 0.018 | 0.023 |
| A37 | alpha | 12 | 0.001 | 0.008 | 0.002 | - |
| (background) | beta | 12 | 0.012 | 0.067 | 0.023 | - |
| A41 | alpha | 12 | 0.000 | 0.002 | 0.001 | 0.002 |
| | beta | 12 | 0.004 | 0.027 | 0.014 | 0.023 |

^a Alpha and beta measured in pCi/m³.

^b Measurement of alpha and beta at locations A12 and A29 calculated based on a flow rate of 9 ft³/hr. Neither sampler was equipped with a gas meter in 1999.

Table 2.9. USEC direct radiation monitoring program quarterly external gamma radiation measurements (mrem) – 1999

| FIRST QUARTER (hours in field 1992) | | | | | | SECOND QUARTER (hours in field 2328) | | | | | |
|-------------------------------------|-----|------|-----|---------|---------|--------------------------------------|------|-----|---------|---------|--|
| Location | # | Deep | Eye | Shallow | Neutron | # | Deep | Eye | Shallow | Neutron | |
| A3 | 001 | 19 | 20 | 29 | 0 | 001 | 27 | 27 | 27 | 0 | |
| A6 | 002 | 18 | 19 | 26 | 0 | 002 | 21 | 21 | 25 | 0 | |
| A8 | 003 | 21 | 22 | 31 | 0 | 003 | 23 | 23 | 23 | 0 | |
| A9 | 004 | 19 | 19 | 22 | 0 | 004 | 21 | 21 | 23 | 0 | |
| A12 | 005 | 21 | 21 | 23 | 0 | 005 | 21 | 21 | 21 | 0 | |
| A15 | 006 | 21 | 21 | 24 | 0 | 006 | 23 | 23 | 23 | 0 | |
| A23 | 007 | 19 | 19 | 20 | 0 | 007 | 21 | 22 | 34 | 0 | |
| A24 | 008 | 19 | 19 | 20 | 0 | 008 | 21 | 22 | 22 | 0 | |
| A28 | 009 | 19 | 19 | 20 | 0 | 009 | 23 | 23 | 25 | 0 | |
| A29 | 010 | 17 | 17 | 19 | 0 | 010 | 21 | 21 | 21 | 0 | |
| A35 | 011 | 22 | 22 | 23 | 0 | 011 | 23 | 23 | 25 | 0 | |
| A36 | 012 | 19 | 19 | 22 | 0 | 012 | 23 | 23 | 25 | 0 | |
| A40 | 013 | 16 | 18 | 26 | 0 | 013 | 18 | 18 | 20 | 0 | |
| 518 | 014 | 20 | 20 | 22 | 0 | 014 | 21 | 21 | 24 | 0 | |
| 737 | 015 | 19 | 19 | 22 | 0 | 015 | 22 | 22 | 26 | 0 | |
| 862 | 016 | 19 | 24 | 31 | 0 | 016 | 21 | 25 | 32 | 0 | |
| 874 | 017 | 136 | 136 | 136 | 29 | 017 | 140 | 140 | 147 | 30 | |
| 906 | 018 | 18 | 18 | 19 | 0 | 018 | 19 | 19 | 23 | 0 | |
| 933 | 019 | 19 | 19 | 20 | 0 | 020 | 19 | 22 | 23 | 0 | |
| 1404A | 020 | 19 | 20 | 32 | 0 | 019 | 22 | 22 | 22 | 0 | |
| A37 | 021 | 20 | 20 | 21 | 0 | 021 | 22 | 22 | 26 | 0 | |

Table 2.9. USEC direct radiation monitoring program quarterly external gamma radiation measurements (mrem) – 1999 (continued)

| Location | # | THIRD QUARTER (hours in field 2064) | | | | FOURTH QUARTER (hours in field 2352) | | | | |
|------------------|-----|-------------------------------------|-----|---------|---------|--------------------------------------|------|-----|---------|---------|
| | | Deep | Eye | Shallow | Neutron | # | Deep | Eye | Shallow | Neutron |
| A3 | 001 | 20 | 20 | 22 | 0 | 001 | 26 | 26 | 28 | 0 |
| A6 | 002 | 18 | 18 | 19 | 0 | 002 | 23 | 23 | 27 | 0 |
| A8 | 003 | 21 | 21 | 21 | 0 | 003 | 27 | 27 | 27 | 0 |
| A9 | 004 | 19 | 19 | 19 | 0 | 004 | 23 | 23 | 25 | 0 |
| A12 | 005 | 18 | 18 | 18 | 0 | 005 | 24 | 24 | 28 | 0 |
| A15 | 006 | 20 | 20 | 20 | 0 | 006 | 26 | 26 | 27 | 0 |
| A23 | 007 | 19 | 19 | 22 | 0 | 007 | 24 | 24 | 24 | 0 |
| A24 | 008 | 19 | 19 | 22 | 0 | 008 | 24 | 28 | 32 | 0 |
| A28 | 009 | 20 | 20 | 22 | 0 | 009 | 25 | 25 | 25 | 0 |
| A29 | 010 | 18 | 18 | 21 | 0 | 010 | 23 | 23 | 23 | 0 |
| A35 | 011 | 19 | 19 | 19 | 0 | 011 | 25 | 25 | 25 | 0 |
| A36 | 012 | 20 | 20 | 20 | 0 | 012 | 26 | 26 | 30 | 0 |
| A40 | 013 | 15 | 15 | 15 | 0 | 013 | 20 | 21 | 37 | 0 |
| 518 | 014 | 16 | 17 | 17 | 0 | 014 | 24 | 24 | 25 | 0 |
| 737 | 015 | 16 | 19 | 21 | 0 | 015 | 24 | 24 | 36 | 0 |
| 862 | 016 | 19 | 19 | 19 | 0 | 016 | 25 | 25 | 26 | 0 |
| 874 | 017 | 130 | 130 | 132 | 28 | 017 | 168 | 168 | 173 | 39 |
| 906 | 018 | 15 | 17 | 17 | 0 | 018 | 22 | 22 | 24 | 0 |
| 933 | 019 | 19 | 21 | 22 | 0 | 020 | 33 | 33 | 37 | 0 |
| 1404A | 020 | 21 | 21 | 21 | 0 | 019 | 29 | 29 | 29 | 0 |
| A37 ^a | 021 | - | - | - | - | 021 | 31 | 31 | 31 | 0 |

^a No data for third quarter. Thermoluminescent dosimeter could not be read by laboratory.

Table 2.10. USEC direct radiation monitoring program summary of quarterly external gamma radiation levels (Frem/hr) – 1999

| Location | First quarter | Second quarter | Third quarter | Fourth quarter |
|--------------------------------|---------------|----------------|---------------|----------------|
| <i>On-site (excluding 874)</i> | | | | |
| 518 | 10.0 | 9.0 | 7.8 | 10.2 |
| 862 | 9.5 | 9.0 | 9.2 | 10.6 |
| 906 | 9.0 | 8.2 | 7.3 | 9.4 |
| 933 | 9.5 | 8.2 | 9.2 | 14.0 |
| 1404A | 9.5 | 9.5 | 10.2 | 12.3 |
| A35 | 11.0 | 9.9 | 9.2 | 10.6 |
| A40 | 8.0 | 7.7 | 7.3 | 8.5 |
| A36 | 9.5 | 9.9 | 9.7 | 11.1 |
| Mean | 9.5 | 8.9 | 8.7 | 10.8 |
| Standard Deviation | 0.79 | 0.77 | 1.06 | 1.60 |
| 874 | 68.3 | 60.1 | 63.0 | 71.4 |
| <i>Reservation Boundary</i> | | | | |
| A3 | 9.5 | 11.6 | 9.7 | 11.1 |
| A8 | 10.5 | 9.9 | 10.2 | 11.5 |
| A9 | 9.5 | 9.0 | 9.2 | 9.8 |
| A12 | 10.5 | 9.0 | 8.7 | 10.2 |
| A15 | 10.5 | 9.9 | 9.7 | 11.1 |
| A23 | 9.5 | 9.0 | 9.2 | 10.2 |
| A24 | 9.5 | 9.0 | 9.2 | 10.2 |
| A29 | 8.5 | 9.0 | 8.7 | 9.8 |
| Mean | 9.8 | 9.6 | 9.3 | 10.5 |
| Standard Deviation | 0.66 | 0.9 | 0.5 | 0.6 |
| <i>Offsite</i> | | | | |
| A6 (Piketon) | 9.0 | 9.0 | 8.7 | 9.8 |
| A28 (Camp Creek) | 9.5 | 9.9 | 9.7 | 10.6 |

**Table 2.11. USEC surface water monitoring program
results of radiological monitoring – 1999**

| Location | | No. of samples ^a | Minimum | Maximum | Average ^b | DCG ^c |
|-----------------------------|---------|-----------------------------|---------|---------|----------------------|------------------|
| <i>gross alpha (pCi/L)</i> | | | | | | |
| Scioto River | RW-1 | 53(42) | <2 | 10 | — | NA |
| | RW-6 | 53(39) | <2 | 12 | — | NA |
| Little Beaver Creek | RW-7 | 12(4) | <4 | 11 | — | NA |
| | RW-8 | 53(30) | <3 | 24 | — | NA |
| Big Beaver Creek | RW-12 | 12(12) | <4 | <6 | — | NA |
| | RW-5 | 12(9) | <4 | 6 | — | NA |
| Big Run Creek | RW-13 | 12(9) | <4 | 31 | — | NA |
| | RW-2 | 11(10) | <4 | 9 | — | NA |
| Background creeks | RW-3 | 11(10) | <5 | 12 | — | NA |
| | RW-33 | 12(12) | <4 | <6 | — | NA |
| Background creeks | RW-10 N | 12(11) | <4 | 8 | — | NA |
| | RW-10 E | 12(10) | <3 | 6 | — | NA |
| Background creeks | RW-10 S | 12(11) | <3 | 11 | — | NA |
| | RW-10 W | 12(12) | <3 | <7 | — | NA |
| <i>gross beta (pCi/L)</i> | | | | | | |
| Scioto River | RW-1 | 53(23) | <8 | 32 | — | NA |
| | RW-6 | 53(22) | <7 | 40 | — | NA |
| Little Beaver Creek | RW-7 | 12(5) | <7 | 29 | — | NA |
| | RW-8 | 53(12) | <7 | 52 | — | NA |
| Big Beaver Creek | RW-12 | 12(8) | <6 | 16 | — | NA |
| | RW-5 | 12(7) | <7 | 14 | — | NA |
| Big Run Creek | RW-13 | 12(4) | <7 | 62 | — | NA |
| | RW-2 | 11(8) | <8 | 27 | — | NA |
| Background creeks | RW-3 | 11(8) | <8 | 17 | — | NA |
| | RW-33 | 12(5) | <10 | 28 | — | NA |
| Background creeks | RW-10 N | 12(6) | <6 | 20 | — | NA |
| | RW-10 E | 12(7) | <6 | 18 | — | NA |
| Background creeks | RW-10 S | 12(6) | <7 | 24 | — | NA |
| | RW-10 W | 12(9) | <7 | 16 | — | NA |
| <i>total uranium (Fg/L)</i> | | | | | | |
| Scioto River | RW-1 | 53(2) | <1.0 | 2.1 | <1.6 | NA |
| | RW-6 | 53(2) | <1.0 | 2.3 | <1.6 | NA |
| Little Beaver Creek | RW-7 | 12(1) | <1.0 | 2.3 | <1.9 | NA |
| | RW-8 | 53(0) | 1.0 | 7.7 | 1.8 | NA |
| Big Beaver Creek | RW-12 | 12(12) | <1.0 | <1.0 | — | NA |
| | RW-5 | 12(9) | <1.0 | 1.8 | — | NA |
| Big Run Creek | RW-13 | 12(6) | <1.0 | 2.5 | — | NA |
| | RW-2 | 11(7) | <1.0 | 1.5 | — | NA |
| Big Run Creek | RW-3 | 11(2) | <1.0 | 3.2 | <2.0 | NA |
| | RW-33 | 12(12) | <1.0 | <1.0 | — | NA |
| Background creeks | RW-10 N | 12(11) | <1.0 | 1.2 | — | NA |
| | RW-10 E | 12(11) | <1.0 | 2.0 | — | NA |
| Background creeks | RW-10 S | 12(11) | <1.0 | 1.9 | — | NA |
| | RW-10 W | 12(12) | <1.0 | <1.0 | — | NA |

**Table 2.11. USEC surface water monitoring program results
of radiological monitoring – 1999 (continued)**

| Location | | No. of samples ^a | Minimum | Maximum | Average ^b | DCG ^c |
|------------------------------|---------|-----------------------------|---------|---------|----------------------|------------------|
| <i>technetium-99 (pCi/L)</i> | | | | | | |
| Scioto River | RW-1 | 53(53) | <10 | <28 | — | 100,000 |
| | RW-6 | 53(52) | <10 | 28 | — | 100,000 |
| Little Beaver Creek | RW-7 | 12(12) | <11 | <28 | — | 100,000 |
| | RW-8 | 53(53) | <10 | <28 | — | 100,000 |
| Big Beaver Creek | RW-12 | 12(12) | <10 | <28 | — | 100,000 |
| | RW-5 | 12(12) | <10 | <28 | — | 100,000 |
| | RW-13 | 12(12) | <10 | <28 | — | 100,000 |
| | RW-2 | 11(11) | <11 | <28 | — | 100,000 |
| Big Run Creek | RW-3 | 11(11) | <11 | <28 | — | 100,000 |
| | RW-33 | 12(12) | <10 | <28 | — | 100,000 |
| | RW-10 N | 12(12) | <10 | <28 | — | 100,000 |
| Background creeks | RW-10 E | 12(12) | <10 | <28 | — | 100,000 |
| | RW-10 S | 12(12) | <10 | <28 | — | 100,000 |
| | RW-10 W | 12(12) | <10 | <28 | — | 100,000 |

^a The number in parentheses is the number of samples that were below the detection limit.

^b The average is not calculated for locations that had greater than 15% of the results below the detection limit.

^c Derived concentration guide. A DCG is not available for gross alpha, gross beta, or total uranium.

Table 2.12. USEC sediment monitoring program monitoring results – 1999

| Analyte | Units | Spring | Fall | Spring | Fall |
|--------------------------------|-------|---------------------------|--------|--------------|---------|
| <i>Scioto River</i> | | | | | |
| <i>RM-6</i> | | <i>Upstream @ Piketon</i> | | <i>RM-1</i> | |
| <i>Downstream @ Lucasville</i> | | | | | |
| Aluminum | mg/kg | 3,510 | 2,700 | 9,310 | 2,330 |
| Antimony | mg/kg | < 3.9 | < 3.95 | < 3.9 | < 38.9 |
| Arsenic | mg/kg | 10.0 | 3.37 | 19.9 | < 28.1 |
| Barium | mg/kg | 36.9 | 33.2 | 82.3 | 48.1 |
| Beryllium | mg/kg | 0.26 | 0.232 | 0.58 | < 0.191 |
| Cadmium | mg/kg | 0.37 | 0.34 | 0.60 | <2.19 |
| Calcium | mg/kg | 17,800 | 13,000 | 7,160 | 45,200 |
| Chromium | mg/kg | 6.3 | 5.21 | 11.5 | <11.7 |
| Copper | mg/kg | 7.8 | 9.71 | 14.1 | 5.33 |
| Iron | mg/kg | 8,500 | 7,550 | 16,400 | 6,680 |
| Lead | mg/kg | 6.4 | 10.3 | 11.9 | < 28.1 |
| Magnesium | mg/kg | 6,600 | 4,430 | 4,550 | 5,900 |
| Manganese | mg/kg | 151 | 173 | 298 | 271 |
| Mercury | mg/kg | 0.025 | 0.026 | 0.024 | 0.025 |
| Nickel | mg/kg | 8.7 | 8.25 | 16.2 | 8.47 |
| Potassium | mg/kg | 538 | 376 | 1,060 | < 379 |
| Selenium | mg/kg | 4.4 | < 3.27 | 8.7 | < 32.3 |
| Silicon | mg/kg | 284 | 176 | 395 | 196 |
| Silver | mg/kg | 5.3 | 3.50 | 2.4 | 4.95 |
| Thallium | mg/kg | 8.3 | < 3.79 | 11.2 | < 37.3 |
| Zinc | mg/kg | 47.8 | 39.2 | 57.2 | 88.1 |
| Total PCBs | Fg/g | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Gross Alpha Activity | pCi/g | < 6 | 3 | < 6 | 7 |
| Gross Beta Activity | pCi/g | < 17 | < 10 | 19 | < 10 |
| Technetium | pCi/g | < 0.2 | < 0.2 | < 0.2 | < 0.2 |
| Uranium | Fg/g | 4.6 | 1.8 | 4.4 | 2.4 |
| <i>Little Beaver Creek</i> | | | | | |
| <i>RM-12</i> | | <i>Upstream</i> | | <i>RM-11</i> | |
| <i>X-230J7 Discharge</i> | | | | | |
| Aluminum | mg/kg | 3,120 | 3,500 | 5,660 | 2,530 |
| Antimony | mg/kg | < 3.8 | < 3.66 | 4.4 | < 3.73 |
| Arsenic | mg/kg | 17.2 | 2.91 | 30.0 | 6.40 |
| Barium | mg/kg | 26.5 | 36.2 | 46.4 | 23.4 |
| Beryllium | mg/kg | 0.30 | 0.467 | 0.53 | 0.485 |
| Cadmium | mg/kg | 0.26 | 0.598 | 3.0 | 0.571 |
| Calcium | mg/kg | 431 | 348 | 5,400 | 690 |
| Chromium | mg/kg | 6.3 | 8.62 | 37.0 | 9.85 |
| Copper | mg/kg | 6.2 | 7.58 | 28.3 | 9.27 |
| Iron | mg/kg | 10,300 | 12,700 | 20,500 | 15,100 |

Table 2.12. USEC sediment monitoring program monitoring results – 1999 (continued)

| Analyte | Units | Spring | Fall | Spring | Fall |
|----------------------------|-------|---------------------------------|---------|---|---------|
| <i>Little Beaver Creek</i> | | | | | |
| | | <i>RM-12 Upstream</i> | | <i>RM-11 X-230J7 Discharge</i> | |
| Lead | mg/kg | 8.2 | 10.2 | 25.7 | 12.5 |
| Magnesium | mg/kg | 510 | 728 | 3,410 | 550 |
| Manganese | mg/kg | 187 | 182 | 734 | 275 |
| Mercury | mg/kg | < 0.022 | < 0.025 | 0.811 | < 0.024 |
| Nickel | mg/kg | 5.1 | 8.13 | 50.8 | 7.33 |
| Potassium | mg/kg | 498 | 474 | 404 | 232 |
| Selenium | mg/kg | 9.5 | 8.70 | 15.4 | 10.9 |
| Silicon | mg/kg | 303 | 244 | 494 | 142 |
| Silver | mg/kg | 1.9 | 2.07 | 5.7 | 3.53 |
| Thallium | mg/kg | 5.3 | < 3.51 | 9.1 | < 35.7 |
| Zinc | mg/kg | 27.5 | 24.4 | 206 | 49.1 |
| Total PCBs | Fg/g | < 0.5 | < 0.5 | 2.1 | < 0.5 |
| Gross Alpha Activity | pCi/g | < 6 | 8 | 24 | 6 |
| Gross Beta Activity | pCi/g | < 16 | < 12 | 43 | < 12 |
| Technetium | pCi/g | < 0.2 | < 0.2 | 29.1 | 0.9 |
| Uranium | Fg/g | 3.4 | 2.9 | 10.6 | 3.6 |
| <i>Little Beaver Creek</i> | | | | | |
| | | <i>RM-8 Downstream @ PL</i> | | <i>RM-7 Downstream @ Confluence</i> | |
| Aluminum | mg/kg | 3,500 | 2,750 | 5,780 | 3,440 |
| Antimony | mg/kg | 7.7 | < 3.83 | < 4 | < 34.5 |
| Arsenic | mg/kg | 57.9 | 3.67 | 18.2 | < 24.9 |
| Barium | mg/kg | 29.1 | 27.1 | 49.2 | 73.3 |
| Beryllium | mg/kg | 0.57 | 0.404 | 0.44 | 0.525 |
| Cadmium | mg/kg | 1.5 | 1.20 | 0.69 | < 1.95 |
| Calcium | mg/kg | 2,020 | 1,620 | 5,620 | 63,900 |
| Chromium | mg/kg | 17.8 | 10.7 | 19.2 | 2,150 |
| Copper | mg/kg | 10.0 | 12.7 | 11.2 | 32.1 |
| Iron | mg/kg | 34,500 | 12,600 | 14,800 | 21,200 |
| Lead | mg/kg | 11.3 | 9.66 | 8.2 | < 24.9 |
| Magnesium | mg/kg | 1,210 | 1,130 | 2,060 | 2,650 |
| Manganese | mg/kg | 355 | 437 | 353 | 568 |
| Mercury | mg/kg | 0.038 | < 0.024 | 0.695 | 0.100 |
| Nickel | mg/kg | 23.6 | 21.6 | 20.6 | 13.1 |
| Potassium | mg/kg | 452 | 310 | 712 | < 336 |
| Selenium | mg/kg | 29.0 | 7.73 | 8.7 | < 28.6 |
| Silicon | mg/kg | 322 | 379 | 276 | 589 |
| Silver | mg/kg | 10.0 | 2.78 | 2.8 | 5.29 |
| Thallium | mg/kg | 18.0 | < 3.67 | 16.2 | < 33.1 |
| Zinc | mg/kg | 109 | 134 | 56.2 | 194 |

Table 2.12. USEC sediment monitoring program monitoring results – 1999 (continued)

| Analyte | Units | Spring | Fall | Spring | Fall |
|-------------------------|-------|----------------------------|------------------------|--------------|--------------------------------|
| | | <i>Little Beaver Creek</i> | | | |
| | | <i>RM-8</i> | <i>Downstream @ PL</i> | <i>RM-7</i> | <i>Downstream @ Confluence</i> |
| Total PCBs | Fg/g | 0.29 | < 0.5 | 0.68 | < 0.5 |
| Gross Alpha Activity | pCi/g | 22 | 22 | 7 | 11 |
| Gross Beta Activity | pCi/g | 20 | 23 | 66 | 21 |
| Technetium | pCi/g | 9.3 | 8.2 | 48.7 | 7.5 |
| Uranium | Fg/g | 6.7 | 5.8 | 5.5 | 4.5 |
| <i>Big Beaver Creek</i> | | | | | |
| | | <i>RM-5</i> | <i>Upstream</i> | <i>RM-13</i> | <i>Downstream</i> |
| Aluminum | mg/kg | 3,540 | 2,960 | 3,100 | 2,910 |
| Antimony | mg/kg | < 4.1 | < 3.93 | < 4.1 | < 4.02 |
| Arsenic | mg/kg | 10.6 | 2.83 | 8.3 | < 2.89 |
| Barium | mg/kg | 35.2 | 45.6 | 31.9 | 33.8 |
| Beryllium | mg/kg | 0.33 | 0.355 | 0.28 | 0.366 |
| Cadmium | mg/kg | 0.60 | 0.50 | < 0.23 | 0.926 |
| Calcium | mg/kg | 2,940 | 3,730 | 2,100 | 4,340 |
| Chromium | mg/kg | 5.8 | 5.98 | 5.0 | 6.91 |
| Copper | mg/kg | 7.4 | 9.12 | 4.6 | 10.3 |
| Iron | mg/kg | 8,540 | 9,950 | 6,830 | 9,050 |
| Lead | mg/kg | 7.3 | 13.6 | 8.5 | 9.49 |
| Magnesium | mg/kg | 1,800 | 2,110 | 1,380 | 2,730 |
| Manganese | mg/kg | 281 | 461 | 252 | 243 |
| Mercury | mg/kg | < 0.025 | < 0.022 | < 0.024 | 0.028 |
| Nickel | mg/kg | 9.9 | 10.2 | 7.0 | 14.9 |
| Potassium | mg/kg | 537 | 482 | 479 | 404 |
| Selenium | mg/kg | - | 6.47 | 4.4 | 6.73 |
| Silicon | mg/kg | 347 | 142 | 203 | - |
| Silver | mg/kg | 2.1 | 2.60 | 1.3 | 2.58 |
| Thallium | mg/kg | 6.3 | < 3.77 | < 3.9 | < 3.85 |
| Zinc | mg/kg | 36.1 | 39.3 | 35.7 | 70.6 |
| Total PCBs | Fg/g | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Gross Alpha Activity | pCi/g | 7 | 9 | < 6 | 8 |
| Gross Beta Activity | pCi/g | 15 | < 12 | < 17 | 14 |
| Technetium | pCi/g | 0.2 | < 0.2 | 1.1 | 6.3 |
| Uranium | Fg/g | 3.2 | 3.0 | 3.7 | 3.9 |

Table 2.12. USEC sediment monitoring program monitoring results – 1999 (continued)

| Analyte | Units | Spring | Fall | Spring | Fall |
|--|-------|---------------------------------|---------|----------------------------------|---------|
| <i>Big Run Creek</i> | | | | | |
| | | <i>RM-33</i> <i>Upstream</i> | | <i>RM-3</i> <i>Downstream</i> | |
| Aluminum | mg/kg | 3,820 | 2,380 | 3,800 | 3,560 |
| Antimony | mg/kg | < 4 | < 3.88 | < 4.1 | < 3.68 |
| Arsenic | mg/kg | 22.8 | 4.37 | 28.4 | 5.29 |
| Barium | mg/kg | 34.9 | 26.9 | 28.6 | 44.8 |
| Beryllium | mg/kg | 0.42 | 0.308 | 0.62 | 0.459 |
| Cadmium | mg/kg | 0.72 | 0.569 | 0.76 | 0.641 |
| Calcium | mg/kg | 574 | 302 | 1,520 | 1,310 |
| Chromium | mg/kg | 7.1 | 4.54 | 11.6 | 6.31 |
| Copper | mg/kg | 6.8 | 6.73 | 8.6 | 7.75 |
| Iron | mg/kg | 14,100 | 10,700 | 16,400 | 10,100 |
| Lead | mg/kg | 11.2 | 9.00 | 13.2 | 10.7 |
| Magnesium | mg/kg | 603 | 400 | 976 | 940 |
| Manganese | mg/kg | 193 | 86.1 | 160 | 473 |
| Mercury | mg/kg | < 0.022 | < 0.024 | < 0.024 | < 0.025 |
| Nickel | mg/kg | 8.8 | 11.1 | 19.6 | 9.80 |
| Potassium | mg/kg | 487 | 321 | 301 | 283 |
| Selenium | mg/kg | 14.0 | 7.27 | 12.6 | 7.52 |
| Silicon | mg/kg | 337 | 180 | 99.2 | 334 |
| Silver | mg/kg | 3.0 | 1.95 | 3.6 | 1.45 |
| Thallium | mg/kg | 6.7 | < 3.72 | < 3.9 | < 3.52 |
| Zinc | mg/kg | 37.9 | 40.1 | 61.9 | 53.5 |
| Total PCBs | Fg/g | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Gross Alpha Activity | pCi/g | < 6 | 4 | 8 | 13 |
| Gross Beta Activity | pCi/g | < 16 | 14 | < 17 | < 11 |
| Technetium | pCi/g | < 0.2 | < 0.2 | 0.6 | 0.9 |
| Uranium | Fg/g | 3.9 | 4.8 | 4.7 | 5.0 |
| <i>RM-2</i> <i>Downstream @ Wakefield</i> | | | | | |
| Aluminum | mg/kg | 2,880 | 3,770 | | |
| Antimony | mg/kg | < 4 | < 4.03 | | |
| Arsenic | mg/kg | 15.8 | 5.48 | | |
| Barium | mg/kg | 27.9 | 32.9 | | |
| Beryllium | mg/kg | 0.39 | 0.451 | | |
| Cadmium | mg/kg | 0.77 | 1.05 | | |
| Calcium | mg/kg | 2,140 | 8,550 | | |
| Chromium | mg/kg | 4.8 | 8.92 | | |
| Copper | mg/kg | 7.8 | 11.8 | | |
| Iron | mg/kg | 9,750 | 16,200 | | |
| Lead | mg/kg | 8.7 | 12.7 | | |

Table 2.12. USEC sediment monitoring program monitoring results – 1999 (continued)

| Analyte | Units | Spring | Fall | Spring | Fall |
|-------------------------------|-------|---------|---------|--------|---------|
| <i>Big Run Creek</i> | | | | | |
| <i>RM-2</i> | | | | | |
| <i>Downstream @ Wakefield</i> | | | | | |
| Magnesium | mg/kg | 1,440 | 4,550 | | |
| Manganese | mg/kg | 194 | 249 | | |
| Mercury | mg/kg | < 0.025 | < 0.024 | | |
| Nickel | mg/kg | 16.5 | 16.3 | | |
| Potassium | mg/kg | 457 | 467 | | |
| Selenium | mg/kg | 6.6 | 7.37 | | |
| Silicon | mg/kg | 265 | 289 | | |
| Silver | mg/kg | 2.6 | 5.49 | | |
| Thallium | mg/kg | < 3.8 | < 3.86 | | |
| Zinc | mg/kg | 65.9 | 70.7 | | |
| Total PCBs | Fg/g | < 0.5 | < 0.5 | | |
| Gross Alpha Activity | pCi/g | 6 | 7 | | |
| Gross Beta Activity | pCi/g | < 17 | < 12 | | |
| Technetium | pCi/g | < 0.2 | < 0.2 | | |
| Uranium | Fg/g | 4.2 | 3.9 | | |
| <i>West Outfalls</i> | | | | | |
| <i>RM-9</i> | | | | | |
| <i>Outfall 012</i> | | | | | |
| <i>RM-10</i> | | | | | |
| <i>Outfall 010/013</i> | | | | | |
| Aluminum | mg/kg | 2,450 | 3,330 | 5,620 | 2,630 |
| Antimony | mg/kg | < 4.1 | < 4.06 | < 4.1 | < 3.41 |
| Arsenic | mg/kg | 6.6 | < 2.92 | 8.0 | < 2.46 |
| Barium | mg/kg | 19.1 | 31.6 | 53.6 | 39.0 |
| Beryllium | mg/kg | 0.15 | 0.277 | 0.50 | 0.446 |
| Cadmium | mg/kg | 0.42 | 0.922 | 0.44 | 0.758 |
| Calcium | mg/kg | 1,360 | 1,640 | 764 | 1,650 |
| Chromium | mg/kg | 3.0 | 4.43 | 8.4 | 5.67 |
| Copper | mg/kg | 5.2 | 8.66 | 11.0 | 7.59 |
| Iron | mg/kg | 4,440 | 11,000 | 10,500 | 12,900 |
| Lead | mg/kg | < 2.9 | 8.25 | 6.0 | 11.5 |
| Magnesium | mg/kg | 812 | 892 | 802 | 1,120 |
| Manganese | mg/kg | 515 | 347 | 123 | 347 |
| Mercury | mg/kg | < 0.024 | < 0.025 | 0.027 | < 0.025 |
| Nickel | mg/kg | 5.5 | 16.2 | 9.2 | 8.33 |
| Potassium | mg/kg | 424 | 459 | 262 | 218 |
| Selenium | mg/kg | < 3.4 | < 3.36 | 6.8 | 9.93 |
| Silicon | mg/kg | 230 | 206 | 723 | 303 |
| Silver | mg/kg | 0.47 | 1.94 | < 0.41 | 2.98 |
| Thallium | mg/kg | < 3.9 | < 3.89 | 7.1 | < 3.27 |
| Zinc | mg/kg | 104 | 81.1 | 51.4 | 67.9 |
| Total PCBs | Fg/g | < 0.5 | < 0.5 | < 0.5 | < 0.5 |

Table 2.12. USEC sediment monitoring program monitoring results – 1999 (continued)

| Analyte | Units | Spring | Fall | Spring | Fall |
|--------------------------|-------|-------------------------|---------|---------------|---------|
| <i>West Outfalls</i> | | | | | |
| <i>RM-9</i> | | <i>Outfall 012</i> | | <i>RM-10</i> | |
| <i>Outfall 010/013</i> | | | | | |
| Gross Alpha Activity | pCi/g | 15 | 10 | < 5 | 8 |
| Gross Beta Activity | pCi/g | 36 | < 11 | < 9 | < 11 |
| Technetium | pCi/g | < 0.2 | < 0.2 | < 0.2 | 0.3 |
| Uranium | Fg/g | 3.9 | 6.2 | 3.1 | 3.0 |
| <i>Background Creeks</i> | | | | | |
| <i>RM-10N</i> | | <i>North Background</i> | | <i>RM-10E</i> | |
| <i>East Background</i> | | | | | |
| Aluminum | mg/kg | 4,740 | 4,180 | 1,710 | 1,800 |
| Antimony | mg/kg | < 3.9 | < 3.99 | 4.1 | < 3.85 |
| Arsenic | mg/kg | 24.7 | < 2.87 | 6.6 | < 2.78 |
| Barium | mg/kg | 81.0 | 42.7 | 24.9 | 27.2 |
| Beryllium | mg/kg | 0.58 | 0.414 | 0.22 | 0.263 |
| Cadmium | mg/kg | 0.87 | 0.766 | 0.27 | 0.303 |
| Calcium | mg/kg | 1,550 | 2,990 | 388 | 637 |
| Chromium | mg/kg | 9.3 | 6.27 | 3.5 | 4.83 |
| Copper | mg/kg | 13.6 | 7.42 | 2.6 | 3.01 |
| Iron | mg/kg | 18,200 | 11,000 | 5,230 | 6,690 |
| Lead | mg/kg | 10.6 | 7.78 | 6.1 | 2.92 |
| Magnesium | mg/kg | 1,410 | 2,090 | 198 | 406 |
| Manganese | mg/kg | 298 | 301 | 172 | 269 |
| Mercury | mg/kg | < 0.02 | < 0.025 | < 0.02 | < 0.025 |
| Nickel | mg/kg | 20.6 | 15.4 | 3.2 | 5.10 |
| Potassium | mg/kg | 651 | 436 | 214 | 231 |
| Selenium | mg/kg | 17.1 | 5.26 | < 3.4 | < 3.19 |
| Silicon | mg/kg | 264 | 307 | 165 | 302 |
| Silver | mg/kg | 3.8 | 1.78 | 0.81 | 0.935 |
| Thallium | mg/kg | 9.7 | < 3.82 | 6.2 | < 3.69 |
| Zinc | mg/kg | 57.2 | 44.1 | 14.0 | < 23.2 |
| Total PCBs | Fg/g | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Gross Alpha Activity | pCi/g | 6 | 6 | < 6 | < 6 |
| Gross Beta Activity | pCi/g | < 16 | < 10 | < 17 | < 8 |
| Technetium | pCi/g | < 0.2 | < 0.2 | < 0.2 | < 0.1 |
| Uranium | Fg/g | 3.5 | 2.8 | 2.6 | 1.3 |
| <i>RM-10S</i> | | <i>South Background</i> | | <i>RM-10W</i> | |
| <i>West Background</i> | | | | | |
| Aluminum | mg/kg | 2,330 | 1,410 | 1,850 | 3,050 |
| Antimony | mg/kg | < 4 | < 3.93 | < 4.2 | 5.82 |
| Arsenic | mg/kg | 5.90 | < 2.83 | 19.3 | 4.49 |
| Barium | mg/kg | 26.4 | 13.1 | 20.4 | 30.4 |

Table 2.12. USEC sediment monitoring program monitoring results – 1999 (continued)

| Analyte | Units | Spring | Fall | Spring | Fall |
|----------------------|-------|--------------------------|---------|------------------------|--------|
| | | <i>Background Creeks</i> | | | |
| | | <i>RM-10S</i> | | <i>RM-10W</i> | |
| | | <i>South Background</i> | | <i>West Background</i> | |
| Beryllium | mg/kg | 0.21 | 0.116 | 0.32 | 0.511 |
| Cadmium | mg/kg | < 0.23 | < 0.222 | 1.10 | 2.14 |
| Calcium | mg/kg | 689 | 982 | 594 | 860 |
| Chromium | mg/kg | 3.9 | 2.37 | 4.5 | 7.44 |
| Copper | mg/kg | 5.6 | 2.17 | 6.7 | 11.1 |
| Iron | mg/kg | 5340 | 4,240 | 9,500 | 17,100 |
| Lead | mg/kg | 6.5 | < 2.83 | 5.9 | 8.57 |
| Magnesium | mg/kg | 585 | 561 | 471 | 780 |
| Manganese | mg/kg | 130 | 90.5 | 232 | 251 |
| Mercury | mg/kg | < 0.02 | < 0.025 | < 0.02 | 0.027 |
| Nickel | mg/kg | 4.5 | 3.12 | 13.6 | 24.2 |
| Potassium | mg/kg | 242 | 118 | 302 | 554 |
| Selenium | mg/kg | 4.9 | < 3.26 | 6.6 | 11.3 |
| Silicon | mg/kg | 109 | 245 | 168 | 317 |
| Silver | mg/kg | 0.65 | 0.426 | 2.20 | 3.75 |
| Thallium | mg/kg | < 3.9 | < 3.77 | 4.5 | < 3.44 |
| Zinc | mg/kg | 24.1 | 38.6 | 41.8 | 75.6 |
| Total PCBs | Fg/g | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Gross Alpha Activity | pCi/g | < 6 | < 6 | < 6 | 7 |
| Gross Beta Activity | pCi/g | < 16 | 10 | < 17 | < 10 |
| Technetium | pCi/g | < 0.2 | < 0.1 | < 0.2 | < 0.2 |
| Uranium | Fg/g | 3.3 | 2.7 | 5.2 | 4.8 |

Table 2.13. USEC soil monitoring program results – 1999

| Location | Gross Alpha (pCi/g) | | Gross Beta (pCi/g) | | Technetium(pCi/g) | | Uranium (Fg/g) | |
|--|---------------------|------|--------------------|------|-------------------|-------|----------------|------|
| | Spring | Fall | Spring | Fall | Spring | Fall | Spring | Fall |
| <i>Internal soil samples</i> | | | | | | | | |
| RIS 1 | 9 | 9 | 10 | 19 | 1.4 | 0.3 | 3.8 | 2.1 |
| RIS 3 | 7 | 39 | 18 | 23 | < 0.2 | 1.8 | 3.5 | 10.3 |
| RIS 5 | 8 | 8 | 11 | 12 | < 0.2 | 4.7 | 5.2 | 4.7 |
| RIS12 | 13 | 18 | 20 | 23 | 6.8 | 7.6 | 4.3 | 7.6 |
| RIS15 | 6 | 11 | < 9 | 20 | < 0.2 | < 0.2 | 3.5 | 5.5 |
| RIS17 | 10 | 7 | 10 | < 11 | < 0.2 | < 0.1 | 3.6 | 3.3 |
| RIS19 | 26 | 62 | 57 | 58 | 34.1 | 20.8 | 19.7 | 17.4 |
| RIS22 | 16 | 15 | 26 | 22 | 5.0 | 6 | 6.1 | 6.0 |
| RIS25 | 6 | 8 | 9 | < 8 | 0.9 | < 0.2 | 4.2 | 3.5 |
| RIS26 | 13 | 20 | 19 | 12 | 6.3 | 3.5 | 4.1 | 3.5 |
| RIS32 | 20 | 11 | < 18 | 12 | 3.2 | 4.1 | 5.7 | 4.1 |
| RIS33 | 11 | 22 | < 19 | 24 | 0.3 | 6.5 | 3.3 | 6.5 |
| RIS34 | 14 | 13 | 46 | 16 | 13.9 | 3.6 | 8.2 | 3.6 |
| RIS35 | 12 | 7 | 10 | 10 | < 0.2 | < 0.2 | 4.1 | 3.1 |
| RIS36 | < 7 | 5 | < 18 | 8 | < 0.3 | 3.6 | 3.1 | 3.6 |
| <i>External soil samples</i> | | | | | | | | |
| <i>Group I – on-site (DOE reservation)</i> | | | | | | | | |
| SAS 3 | < 6 | 10 | 10 | < 12 | < 0.2 | 0.2 | 3.6 | 2.8 |
| SAS 8 | < 5 | 8 | 14 | < 16 | < 0.2 | < 0.1 | 3.0 | 3.3 |
| SAS 9 | 7 | 7 | 11 | < 11 | < 0.2 | < 0.1 | 3.4 | 4.2 |
| SAS10 | 9 | 11 | 14 | 14 | < 0.3 | < 0.2 | 2.8 | 3.3 |
| SAS11 | < 8 | 9 | 10 | 17 | 0.6 | 0.2 | 3.7 | 3.5 |
| SAS12 | < 6 | 8 | 10 | < 16 | < 0.3 | < 0.1 | 3.9 | 3.1 |
| SAS15 | < 7 | 10 | 14 | < 16 | < 0.3 | 0.1 | 3.5 | 3.4 |
| SAS23 | < 6 | 12 | < 17 | < 16 | < 0.3 | < 0.1 | 3.0 | 2.6 |
| SAS24 | < 7 | 11 | 10 | < 16 | < 0.3 | < 0.1 | 3.7 | 3.2 |
| SAS13 | 7 | 9 | < 17 | < 16 | < 0.2 | < 0.1 | 3.9 | 3.4 |
| SAS14 | 13 | 11 | 24 | 20 | 0.3 | 0.2 | 4.2 | 3.5 |
| SAS16 | < 6 | 8 | 17 | < 16 | < 0.3 | < 0.1 | 3.6 | 2.7 |
| SAS20 | 6 | 8 | 11 | < 16 | < 0.3 | < 0.1 | 3.8 | 2.6 |
| SAS27 | 10 | 6 | 15 | < 16 | < 0.2 | < 0.1 | 4.2 | 3.2 |
| SAS29 | < 6 | 7 | < 9 | < 8 | < 0.3 | < 0.2 | 2.7 | 2.3 |

Table 2.13. USEC soil monitoring program results – 1999 (continued)

| Location | Gross Alpha (pCi/g) | | Gross Beta (pCi/g) | | Technetium(pCi/g) | | Uranium (Fg/g) | |
|--|---------------------|------|--------------------|------|-------------------|-------|----------------|------|
| | Spring | Fall | Spring | Fall | Spring | Fall | Spring | Fall |
| <i>Group II – off-site (up to 5 km off-site)</i> | | | | | | | | |
| SAS 1 | < 6 | 5 | 11 | 14 | < 0.2 | < 0.1 | 4.4 | 2.8 |
| SAS 2 | < 7 | 8 | 12 | 16 | < 0.3 | < 0.1 | 2.7 | 2.8 |
| SAS 4 | < 5 | 16 | 17 | < 16 | < 0.2 | < 0.1 | 3.1 | 2.7 |
| SAS 6 | < 6 | 6 | 12 | 18 | < 0.2 | < 0.1 | 3.5 | 2.5 |
| SAS17 | < 8 | 12 | 11 | < 16 | 0.8 | < 0.1 | 3.3 | 2.2 |
| SAS18 | < 7 | 7 | < 9 | < 16 | < 0.3 | < 0.1 | 2.4 | 2.7 |
| SAS19 | < 8 | 6 | 15 | < 16 | < 0.3 | < 0.1 | 2.6 | 2.7 |
| SAS21 | 11 | < 4 | 19 | < 16 | < 0.3 | < 0.1 | 4.0 | 3.4 |
| SAS22 | < 6 | 10 | 9 | < 16 | < 0.3 | < 0.1 | 3.9 | 2.9 |
| SAS25 | < 6 | 12 | 16 | 17 | < 0.2 | < 0.1 | 3.7 | 3.2 |
| SAS26 | 8 | 16 | 15 | < 16 | < 0.2 | < 0.1 | 4.6 | 4.8 |
| SAS28 | < 5 | 7 | 12 | < 16 | < 0.2 | < 0.1 | 3.7 | 2.9 |
| <i>Group III – Remote (5 to 16 km off-site)</i> | | | | | | | | |
| RS10N | < 5 | 8 | 14 | 16 | 0.5 | < 0.1 | 3.6 | 3.0 |
| RS10E | < 5 | 7 | < 8 | < 16 | < 0.2 | < 0.1 | 2.9 | 2.2 |
| RS10S | < 5 | 8 | 14 | < 16 | < 0.2 | < 0.1 | 3.1 | 3.2 |
| RS10W | 8 | 12 | 20 | 15 | < 0.2 | < 0.1 | 6.2 | 5.2 |

Table 2.14. USEC vegetation monitoring program results – 1999

| Location | Fluorides (Fg/g) | | Technetium (pCi/g) | | Uranium (Fg/g) | |
|--|------------------|-------|--------------------|-------|----------------|--------|
| | Spring | Fall | Spring | Fall | Spring | Fall |
| <i>Internal vegetation samples</i> | | | | | | |
| RIV 1 | 4.3 | 4.2 | < 0.4 | < 0.4 | < 0.25 | < 0.25 |
| RIV 3 | 5.5 | 7.4 | < 0.4 | 3.4 | < 0.25 | < 0.25 |
| RIV 5 | 14.0 | 22.6 | < 0.4 | 0.2 | < 0.25 | < 0.25 |
| RIV12 | 6.0 | 45.8 | 0.8 | 2.6 | < 0.25 | < 0.25 |
| RIV15 | 2.0 | 8.6 | < 0.4 | < 0.1 | < 0.25 | < 0.25 |
| RIV17 | 3.8 | 1.5 | < 0.4 | < 0.4 | < 0.25 | < 0.25 |
| RIV19 | 12.5 | 15.0 | 0.7 | 30.9 | < 0.25 | < 0.25 |
| RIV22 | 6.2 | 56.8 | 0.8 | 9.7 | < 0.25 | < 0.25 |
| RIV25 | 5.7 | 17.4 | < 0.4 | 1.2 | < 0.25 | < 0.25 |
| RIV26 | 5.5 | 13.8 | 0.6 | 10.0 | < 0.25 | < 0.25 |
| RIV32 | 7.6 | 12.6 | 0.8 | 4.1 | < 0.25 | < 0.25 |
| RIV33 | 8.4 | 10.4 | < 0.4 | 2.4 | < 0.25 | < 0.25 |
| RIV34 | 6.8 | 7.2 | 1.5 | 1.1 | < 0.25 | < 0.25 |
| RIV35 | 1.1 | 8.6 | < 0.4 | 0.1 | < 0.25 | < 0.25 |
| RIV36 | 2.5 | 10.3 | < 0.4 | 0.3 | < 0.25 | < 0.25 |
| <i>External vegetation samples</i> | | | | | | |
| <i>Group I – on-site (DOE reservation)</i> | | | | | | |
| SAV 3 | 3.5 | 3.5 | < 0.3 | < 0.1 | < 0.25 | < 0.25 |
| SAV 8 | 15.7 | 1.0 | < 0.3 | < 0.4 | < 0.25 | < 0.25 |
| SAV 9 | 1.6 | 4.0 | < 0.3 | < 0.1 | < 0.25 | < 0.25 |
| SAV10 | 1.7 | 3.0 | < 0.3 | < 0.4 | < 0.25 | < 0.25 |
| SAV11 | 8.4 | 1.8 | < 0.4 | 1.2 | < 0.25 | < 0.25 |
| SAV12 | 4.2 | 3.1 | < 0.5 | < 0.1 | < 0.25 | < 0.25 |
| SAV15 | 3.3 | 6.6 | < 0.4 | < 0.4 | < 0.25 | < 0.25 |
| SAV23 | 3.3 | 4.2 | < 0.3 | < 0.1 | < 0.25 | < 0.25 |
| SAV24 | 5.0 | 1.5 | 7.3 | 0.4 | < 0.25 | < 0.25 |
| SAV13 | 1.9 | 4.1 | < 0.3 | < 0.1 | < 0.25 | < 0.25 |
| SAV14 | 1.8 | 1.4 | < 0.3 | 0.5 | < 0.25 | < 0.25 |
| SAV16 | 3.2 | 1.9 | < 0.5 | < 0.4 | < 0.25 | < 0.25 |
| SAV20 | 3.0 | 3.1 | < 0.3 | < 0.4 | < 0.25 | < 0.25 |
| SAV27 | 1.5 | < 1.0 | < 0.3 | < 0.1 | < 0.25 | < 0.25 |
| SAV29 | 4.2 | 4.4 | < 0.4 | < 0.1 | < 0.25 | < 0.25 |

Table 2.14. USEC vegetation monitoring program results – 1999 (continued)

| Location | Fluorides (Fg/g) | | Technetium (pCi/g) | | Uranium (Fg/g) | |
|--|------------------|-------|--------------------|-------|----------------|--------|
| | Spring | Fall | Spring | Fall | Spring | Fall |
| <i>Group II – off-site (up to 5 km off-site)</i> | | | | | | |
| SAV 1 | 2.0 | 2.1 | < 0.4 | < 0.4 | < 0.25 | 0.25 |
| SAV 2 | 2.1 | 3.2 | < 0.4 | < 0.4 | < 0.25 | < 0.25 |
| SAV 4 | 1.2 | < 1.0 | < 0.3 | < 0.1 | < 0.25 | < 0.25 |
| SAV 6 | 3.6 | 5.8 | < 0.4 | < 0.1 | < 0.25 | < 0.25 |
| SAV17 | 4.0 | 1.9 | < 0.4 | < 0.4 | < 0.25 | < 0.25 |
| SAV18 | 6.4 | 6.0 | < 0.4 | < 0.4 | < 0.25 | < 0.25 |
| SAV19 | 2.2 | 1.5 | < 0.5 | < 0.4 | < 0.25 | < 0.25 |
| SAV21 | 5.5 | | < 0.3 | | < 0.25 | |
| SAV22 | 2.7 | 1.6 | < 0.3 | < 0.1 | < 0.25 | < 0.25 |
| SAV25 | 2.1 | 1.5 | < 0.3 | < 0.4 | < 0.25 | < 0.25 |
| SAV26 | 1.7 | 1.4 | < 0.3 | < 0.4 | < 0.25 | < 0.25 |
| SAV28 | 3.4 | 2.3 | < 0.4 | < 0.1 | < 0.25 | < 0.25 |
| <i>Group III – Remote (5 to 16 km off-site)</i> | | | | | | |
| RV10N | < 1.0 | 2.1 | < 0.3 | < 0.1 | < 0.25 | < 0.25 |
| RV10E | 3.4 | 1.1 | < 0.3 | < 0.1 | < 0.25 | < 0.25 |
| RV10S | 2.2 | < 1.0 | < 0.3 | < 0.1 | < 0.25 | < 0.25 |
| RV10W | < 1.0 | 2.5 | < 0.4 | < 0.4 | < 0.25 | < 0.25 |

Table 2.15. USEC biota (fish) monitoring program results – 1999

| Location | Type | Chromium (mg/kg) | PCB (Total) (Fg/g) | Gross Alpha Activity (pCi/g) | Gross Beta Activity (pCi/g) | Technetium (pCi/g) | Uranium (Fg/g) |
|-----------------------------------|-------------------|---------------------|-----------------------|------------------------------------|-----------------------------------|-----------------------|-------------------|
| Scioto River, RW-1 | Catfish | < 1 | 0.5 | < 4 | < 7 | 0 | < 0.5 |
| Little Beaver Ck, RW-8 | Bass, Large Mouth | < 1 | 2.7 | < 5 | < 8 | 0 | < 0.5 |
| Little Beaver Ck, RW-8 | Creek Chub | < 1 | 1.4 | < 5 | < 8 | 0 | < 0.5 |
| Little Beaver Ck, RW-8 | Blue Gill | < 1 | 1.0 | < 4 | < 8 | 0 | < 0.5 |
| Little Beaver Ck, RW-8 | Bass, Rock | < 1 | 0.9 | < 4 | < 7 | 0 | < 0.5 |
| Scioto River, RW-1 | Drum | < 1 | 0.5 | < 5 | < 8 | 0 | < 0.5 |
| Scioto River, RW-6 | Catfish | < 1 | < 0.5 | < 4 | < 7 | 0 | < 0.5 |
| Scioto River, RW-6 | Drum | < 1 | 0.9 | < 4 | < 7 | 0 | < 0.5 |
| Scioto River, RW-1 | Drum | 1 | < 0.5 | < 5 | < 8 | 0 | < 0.5 |
| Scioto River, RW-1 | Catfish | < 1 | < 0.5 | NR | NR | NR | < 0.5 |
| Scioto River, RW-6 | Bass, Stripped | < 1 | 0.55 | < 4 | < 9 | 0 | < 0.5 |
| Scioto River, RW-6 | Shad | < 1 | 1.40 | < 5 | < 11 | 0 | < 0.5 |
| Scioto River, Outfalls 003/004 | Drum | < 1 | 0.54 | < 2 | < 4 | 0 | < 0.5 |

NR – Not reported.

Table 2.16. USEC biota (crops) monitoring program results – 1999

| Type | Location | Technetium (pCi/g) | Uranium (Fg/g) |
|--------------|-----------|-----------------------|-------------------|
| Apple | PORTS1 | < 0.3 | < 0.25 |
| Corn | Offsite 1 | < 0.3 | < 0.25 |
| Tomatoes | Offsite 1 | < 0.3 | < 0.25 |
| Corn | Offsite 2 | < 0.3 | < 0.25 |
| Tomatoes | Offsite 2 | < 0.3 | < 0.25 |
| Pumpkin | Offsite 2 | < 0.3 | < 0.25 |
| Apple | Offsite 2 | < 0.3 | < 0.25 |
| Tomatoes | Offsite 3 | < 0.3 | < 0.25 |
| Bell Peppers | Offsite 3 | < 0.3 | < 0.25 |
| Pumpkin | Offsite 3 | < 0.3 | < 0.25 |
| Blackberries | Offsite 3 | < 0.3 | < 0.25 |
| Raspberries | Offsite 3 | < 0.3 | < 0.25 |
| Corn | Offsite 4 | < 0.3 | < 0.25 |
| Broccoli | Offsite 4 | < 0.3 | < 0.25 |
| Tomatoes | Offsite 4 | < 0.3 | < 0.25 |
| Apple | Offsite 4 | < 0.3 | < 0.25 |
| Apple | Offsite 5 | < 0.2 | < 0.05 |
| Tomatoes | Offsite 6 | < 0.3 | < 0.05 |
| Corn | Offsite 6 | < 0.3 | < 0.05 |
| Cabbage | Offsite 6 | < 0.3 | < 0.05 |
| Apple | PORTS2 | < 0.3 | < 0.05 |
| Apple | PORTS3 | < 0.2 | < 0.05 |
| Persimmons | PORTS4 | < 0.3 | < 0.05 |
| Apple | Offsite 7 | < 0.3 | < 0.05 |

PORTS1 Inside Perimeter Road, southeast of plant
 PORTS2 Apple Tree @ X-230L North Holding Pond
 PORTS3 Fog Road
 PORTS4 Cylinder Yard North of H Lot

This page left intentionally blank.

3. DOSE

This section provides summary tables for dose calculations completed by DOE/PORTS. Information is provided for the dose calculation required by the National Emission Standards for Hazardous Air Pollutants for airborne radionuclide emissions. Only DOE air emission sources are included; information on USEC air emission sources is not provided.

The following tables are provided in this section:

- Table 3.1. Curies released by DOE air emission sources in 1999
- Table 3.2. DOE air emission source parameters and receptor locations used in 1999 dose calculations
- Table 3.3. Predicted radiation doses from airborne releases (DOE sources only) at DOE/PORTS for 1999

Table 3.1. Curies released by DOE air emission sources in 1999

| Nuclide | X-744G Glove Box | X-326 L-cage Glove Box | Total |
|-------------------|---------------------|---------------------------|---------|
| Actinium-228 | 7.5E-12 | 5.7E-12 | 1.3E-11 |
| Americium-241 | 7.7E-12 | 8.0E-13 | 8.5E-12 |
| Beryllium-7 | 9.2E-12 | less than detection | 9.2E-12 |
| Bismuth-212 | 4.4E-11 | less than detection | 4.4E-11 |
| Bismuth-214 | 1.1E-11 | 6.5E-12 | 1.8E-11 |
| Lead-212 | 1.4E-10 | 9.6E-12 | 1.5E-10 |
| Lead-214 | 2.2E-11 | 1.1E-11 | 3.3E-11 |
| Neptunium-237 | 3.2E-11 | 1.2E-11 | 4.4E-11 |
| Plutonium-238 | 2.5E-11 | 5.1E-14 | 2.5E-11 |
| Plutonium-239/240 | 3.7E-11 | 1.2E-12 | 3.8E-11 |
| Potassium-40 | 4.4E-10 | 2.6E-10 | 7.0E-10 |
| Protactinium-233 | 5.4E-11 | 4.9E-13 | 5.4E-11 |
| Protactinium-234 | 7.2E-11 | 4.2E-11 | 1.1E-10 |
| Protactinium-234m | 4.7E-07 | 2.0E-08 | 4.9E-07 |
| Radium-224 | 9.1E-11 | 4.8E-11 | 1.4E-10 |
| Radium-226 | 1.1E-10 | 1.1E-11 | 1.2E-10 |
| Radium-228 | 7.5E-12 | 5.7E-12 | 1.3E-11 |
| Technetium-99 | 1.4E-05 | 4.6E-05 | 6.1E-05 |
| Thallium-208 | 2.9E-11 | 2.6E-12 | 3.2E-11 |
| Thorium-228 | 2.9E-10 | 7.5E-12 | 2.9E-10 |
| Thorium-230 | 4.1E-10 | 1.4E-11 | 4.2E-10 |
| Thorium-231 | 5.2E-08 | 5.7E-09 | 5.8E-08 |
| Thorium-232 | 1.6E-12 | less than detection | 1.6E-12 |
| Thorium-234 | 2.1E-07 | 1.1E-08 | 2.2E-07 |
| Uranium-234 | 1.9E-06 | 1.6E-07 | 2.1E-06 |
| Uranium-235 | 8.5E-08 | 6.0E-09 | 9.1E-08 |
| Uranium-236 | 8.2E-09 | 6.6E-10 | 8.9E-09 |
| Uranium-238 | 4.7E-07 | 1.0E-08 | 4.8E-07 |

The emissions (in curies) activities listed above are based on the mass of various materials handled by each of the gloveboxes, the analytical data available on each material, and the emission calculation procedures outlined in 40 CFR 61 Appendix D. Emissions are calculated using the following procedure.

- 1) Determine the mass of each material handled in each glovebox.
 - S The mass of the materials handled is calculated from the batching log sheets that indicate the grams of each material in each container handled in the glovebox for the calendar year.
 - S The total mass of each material is a sum of the mass values for each of the individual containers.
- 2) Determine the radionuclide mass concentrations present in each material.
 - S An average concentration for each of the radionuclides present in each material handled in the gloveboxes is calculated from analytical data on that material.
 - S For the materials handled in these gloveboxes, over 51 percent of the concentrations are based on one or two samples; therefore, a statistical upper confidence interval has not been calculated for any of the radionuclide concentrations.
- 3) Calculate the mass of the radionuclide handled in the glovebox.
 - S Multiply the mass of each material by the radionuclide concentrations for that material.
- 4) Calculate pre-control emissions of each radionuclide.
 - S Multiply the mass of each radionuclide handled in the glovebox by 0.001 to calculate the mass of the radionuclide emitted from the glovebox into the vent stream.
 - S The emission factor of 0.001 is from 40 CFR 61 Appendix D, 2.b.ii for particulate solids.
- 5) Calculate post-control emissions of each radionuclide.
 - S Multiply the pre-control emissions by 0.01 to calculate the mass of the radionuclide emitted from the vent stack into the atmosphere.
 - S The emission factor of 0.01 is from 40 CFR 61 Appendix D, Table 1 for high efficiency particulate air (HEPA) filter control of particulate emissions.
 - S These post-control emissions, in Curies, become the input parameters for the CAP88-PC modeling program.

Table 3.2. DOE air emission source parameters and receptor locations used in 1999 dose calculations

| Name | Type | Release height (m) | Inner diameter (m) | Gas exit velocity (m/s) | Gas exit temperature (°C) | Distance (m) and direction to receptor ^a |
|---------------------------|-------|--------------------|--------------------|-------------------------|---------------------------|---|
| X-744G Glove Box | Point | 6 | 0.05 | 6.98 | Ambient | 1,067 ENE |
| X-326 L-cage Glove Box | Point | 22 | 0.36 | 6.35 | Ambient | 2,286 NE |

^a Receptor is location of maximally exposed individual (resident living near the plant who received the greatest dose resulting from DOE air emissions).

Table 3.3. Predicted radiation doses from airborne releases (DOE sources only) at DOE/PORTS for 1999

| Effective dose equivalent to: | Effective dose equivalent |
|---|---------------------------|
| Maximally exposed individual ^a | 0.00048 mrem/year |
| Population ^b | 0.77 person-mrem/year |
| Nearest community ^c | 0.12 person-mrem/year |

^a Maximally exposed individual (based on combined DOE stacks) resides 1,067 m (3,500 ft) ENE of the X-744G Glove Box and 2,286 m (7,500 ft) NE of the X-326 L-cage Glove Box.

^b Collective effective dose equivalent to population within 50 miles (80 km) of plant site.

^c Collective effective dose equivalent to residents of nearest community (Piketon, Ohio), which for modeling purposes is conservatively assumed to be 2 miles (3500 m) north of the plant site.

This page left intentionally blank.

4. GROUNDWATER

This section summarizes analytical results for groundwater monitoring at PORTS in 1999 at the following locations:

- X-749/X-120/Peter Kiewit (PK) Landfill,
- Quadrant I Groundwater Investigative Area/X-749A Classified Materials Storage Yard,
- Quadrant II Groundwater Investigative Area,
- X-701B Holding Pond,
- X-616 Chromium Sludge Surface Impoundments,
- X-740 Hazardous Waste Storage Facility,
- X-611A Former Lime Sludge Lagoons,
- X-735 Landfills,
- Surface water monitoring locations, and
- Exit pathway monitoring locations.

Results for radiological parameters and volatile organic compounds are reported in this section. All results are included for radiological parameters, even if a specific constituent was not detected at a specific well or location during any sampling event in 1999. Results for chromium at the X-616 are also included in this section because chromium is of special concern in this area.

This section also provides results for beryllium and chromium at the X-611A because these are the only monitoring parameters for this area.

Only those volatile organic compounds that were detected in at least one sampling event are listed in this section. A table for volatile organic compounds at the X-735 Landfills is not provided because volatile organic compounds were not detected at this area. Complete groundwater monitoring results are provided in the *1999 Annual Groundwater Monitoring Report*.

Data qualifiers are letters or symbols used to provide additional information about the analytical results provided in this section. The meaning of each data qualifier is provided below:

- U Undetected. The number provided is the detection limit for the sample.
- B Radionuclides and metals: the reported value was obtained from a reading that was less than practical quantitation limits but greater than or equal to the instrument detection limit.
Volatile organic compounds: the analyte was detected in the blank sample.
- * Duplicate analysis is not within control limits.
- D The reported value was identified from a secondary dilution.
- E The reported value is estimated because of the presence of interferences.
- J The reported value is qualified as estimated.
- N Spike sample recovery is not within limits.

The following tables are included in this section:

- Table 4.1. Volatile organic compounds detected at the X-749/X-120/PK Landfill
- Table 4.2. Results for radionuclides at the X-749/X-120/PK Landfill
- Table 4.3. Volatile organic compounds detected at the Quadrant I Groundwater Investigative Area
- Table 4.4. Results for radionuclides at the Quadrant I Groundwater Investigative Area
- Table 4.5. Volatile organic compounds detected at the Quadrant II Groundwater Investigative Area
- Table 4.6. Results for radionuclides at the Quadrant II Groundwater Investigative Area
- Table 4.7. Volatile organic compounds detected at the X-701B Holding Pond
- Table 4.8. Results for radionuclides at the X-701B Holding Pond
- Table 4.9. Volatile organic compounds detected at the X-616 Chromium Sludge Surface Impoundments
- Table 4.10. Results for chromium at the X-616 Chromium Sludge Surface Impoundments
- Table 4.11. Results for radionuclides at the X-616 Chromium Sludge Surface Impoundments
- Table 4.12. Volatile organic compounds detected at the X-740 Hazardous Waste Storage Facility
- Table 4.13. Results for radionuclides at the X-740 Hazardous Waste Storage Facility
- Table 4.14. Results for beryllium and chromium at the X-611A Former Lime Sludge Lagoons
- Table 4.15. Results for radionuclides at the X-735 Landfills
- Table 4.16. Volatile organic compounds detected at surface water monitoring locations
- Table 4.17. Results for radionuclides at surface water monitoring locations
- Table 4.18. Results for radionuclides at exit pathway monitoring locations